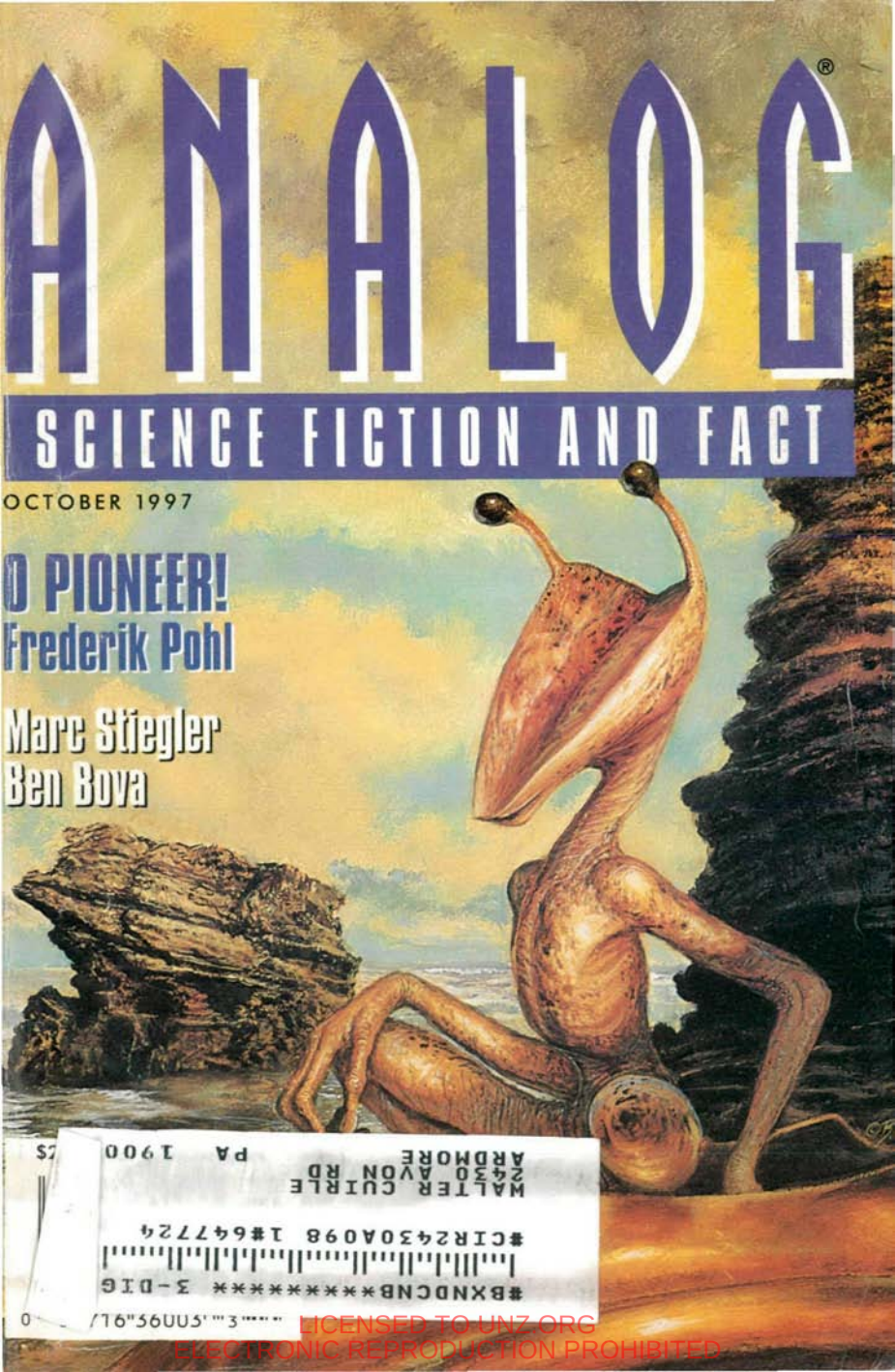

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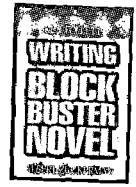

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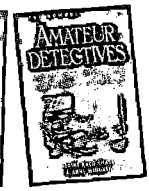

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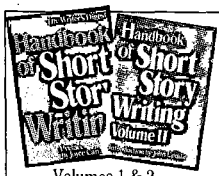

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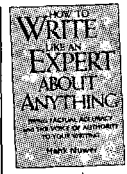

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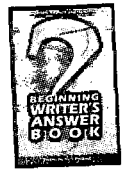

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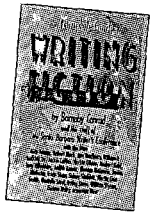

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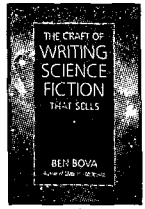

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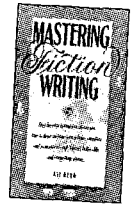

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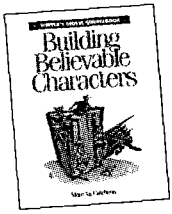

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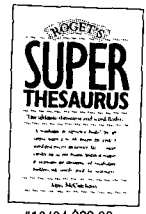

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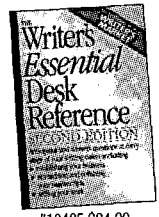

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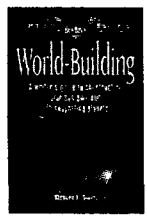

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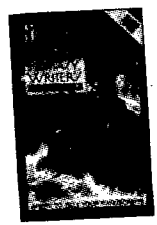
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SCIENCE FICTION AND FACT

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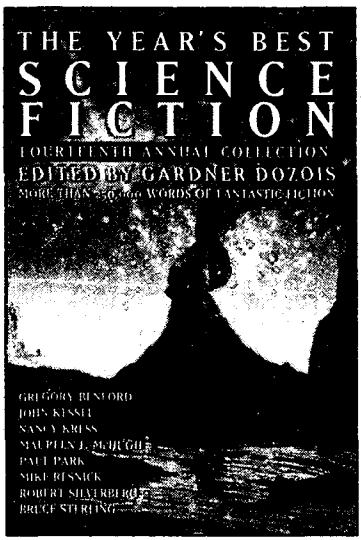

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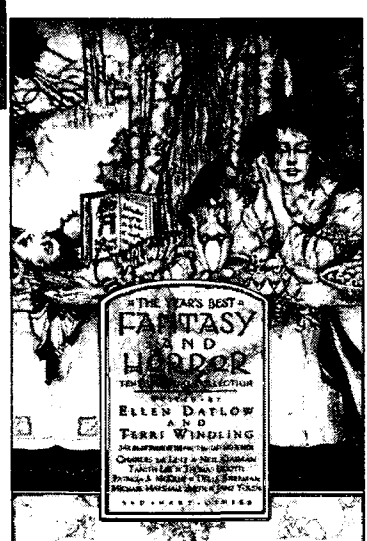

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EDITORIAL Stanley Schmidt

PROPHETIC DÉJÀ VU

It was fascinating to watch the reactions of public figures and the public at large to the announcement of the first successful cloning of an adult mammal. This happened, as you no doubt recall, back in February 1997, and the mammal involved was a sheep named Dolly, a fact leading to plenty of predictably punny headlines.

One of the comments I found most interesting was the reference in Gannett newspapers to "the collective sigh heard from science-fiction [sic] writers, robbed of a favorite story line by science nonfiction."

Robbed? Get serious, folks! That's like claiming there was nothing left to say about rockets and space travel and exploration after the Soviet Union launched Sputnik I in 1957. Science fiction writers had been writing about those things for decades, and they became reality in part because many bright young people recognized the concepts in those stories as real possibilities that they could help make happen—so they did. Yet most of the public, I remember quite vividly, persisted in dismissing the very idea of rockets traveling beyond Earth's atmosphere as "just science fiction"—an impossibility fit only as idle amusement for immature folk with hyperactive imaginations.

People with that attitude were caught completely off guard when newspapers suddenly announced that a basketball-sized satellite had been launched into orbit, and horrified that it had been done not by the US, but by the country we had all been taught to think of as our archenemy. A mad scramble ensued to bring American science and math education up to snuff, and to catch up and "beat the Russians in the Space Race." That led to a series of epochmaking explorations including the first telemetry packages sent for close-up looks at other planets, and the first humans to set foot on the closest of them: our Moon.

Unfortunately, since so much of the Space Race was driven by a rather trivial motivation, it soon lost momentum. Lately we've been in a period of relative (not absolute, and I hope temporary) inactivity, but the fact remains that a good deal of what the science fiction writers envisioned has actually been accomplished. For better or worse, that led to science fiction writers becoming somewhat better known to the general public, and even getting a modicum of respect in

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circles where that had once seemed impossible. And that soon led to people asking science fiction writers things like, "Well, what are you going to write about, now that we've been to the Moon?"

The fact is that science fiction writers were busier than ever, exploring the possibilities for what might be done with space travel *beyond* the Moon, and the implications of the radically new discoveries being made with the new technology about the other planets and stars.

The relationship of cloning to science fiction has followed, and will no doubt continue to follow, a quite similar pattern. Science fiction stories have been dealing with the possibility of cloning, and its possible implications—including the ethical dilemmas it creates—for decades. (In a 1989 article for *Writer's Digest,* I listed badly done clone stories as one of 26 "Ideas That Wouldn't Die!") Cloning of mammals has become reality, in part, because some bright young people recognized the concepts in those stories as real possibilities that they could help make happen—so they became biologists and did the hard, detailed work that that required. Meanwhile most of the public persisted in dismissing the very idea of cloning, or at least human cloning, as "just science fiction"—an impossibility fit only as idle amusement for immature folk with hyperactive imaginations.

People with that attitude were caught completely off guard when newspapers suddenly announced that an adult sheep had been grown from a specialized, nonreproductive cell of another, and genetically identical, adult sheep. They were similarly shocked a few days later by the announcement of cloning of monkeys from embryos—not quite as startling an accomplishment in one sense, but more so in another, since monkeys are even more closely related to humans. A mad scramble ensued among philosophers and theologians and politicians to start figuring out how they should deal with the profound moral and legal questions implicit in this shocking "new" development. "We've all been talking about bioethics," one Greek Orthodox clergyman was quoted as saying, "but the kind that happens in a petri dish. We didn't really approach it beyond that. But now it's here." President Clinton immediately asked a national ethics board to study the situation.

And those of us who have been reading science fiction for any length

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of time found ourselves asking, "Why did they wait so long? We've been warning them for decades!"

But few of them were listening—so once again they got caught completely off guard by something that one group had already been thinking about for years. And once again we have people quite seriously assuming that science fiction writers will have to give up clone stories because one sheep has been cloned!

The fact is that we are about to see a whole new flood of stories about cloning and its ramifications. They will not be inspired by the novelty of the basic idea; for those of us who've been paying attention, it hasn't had that for decades. The real inspiration for the new clone stories will be in the reactions we're beginning to see from people in the population at large who have just begun to catch on to the fact that this stuff is *real*. People's reactions and the ways they tried to use, abuse, and cope with new technologies have always been much of the meat of science fiction, of course. But real people will surely come up with reactions and problems that the writers *didn't* anticipate, and those will provide the impetus for plenty of fresh, new stories. Which, just like the old ones, will be intended not only to entertain, but to stimulate people to think about impending problems *before* they become emergencies.

What's different now is not that we suddenly know that cloning of complex organisms is possible. We've known that for a long time. What's different now is that, for the first time in history, large numbers of people *other* than science fiction writers and scientists are being forced to take that fact seriously.

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To save some of them—whether new writers, religious or political leaders, or just concerned citizens—the trouble of reinventing the biological wheel, this might be a good time to summarize and comment on some of the commoner misconceptions about the whole cloning concept.

For example, those "badly done" cloning stories I mentioned (not to be confused with the best that have been published) often have plots hinging on whether somebody is a "real person" or a clone*. A clone of a person *is* a real person, genetically related to his or her original in *exactly* the same way as an identical twin, the difference being only in the mechanism of production. (Though the fact that so many beginning writers can pose such a question makes it disturbingly likely that some societies will insist on treating cloned humans as if they *were* fundamentally different in some way.)

Another common error is to treat a clone as *identical* to the original, sometimes even to the extent of regarding murder of a clone by the original as "suicide." That won't wash, either. A clone of a human would be not only a real person, but a *different* real person, *genetically* identical but shaped by completely different experiences.

Among unprepared people first hearing about cloning as a real possibility through the news, not surprisingly, the commonest reaction seems to have been some combination of horror, reflexive revulsion, and rationalizations of the belief that it can't or won't be done. No more surprisingly, many of those rationalizations depend on wishful assumptions or ignoring the lessons of history.

A surprising number of people on hearing the news said something like, "But of course it won't be done on humans, because nobody would want to." Even Ian Wilmut, head of the group that cloned Dolly, reportedly said, "There is no clinical reason why you would do this. Why would you make another human being?" I am reminded of the early researcher on electromagnetism who, when asked, "What good is it?" replied, "What good is a newborn baby?"

I can easily imagine that many people *now* can't think of what seems to them a reason for cloning humans, but that by no means proves that no one ever will. Nor does anyone's inability to think of what they consider "good" reasons to do it mean that no one will ever do it for "bad" reasons. A few of the many reasons people have already thought of include providing organ donors, slave laborers, family heirs, or genetic immortality. Others will undoubtedly arise later, some from science fiction writers, others from people who seriously intend to *do* what they've thought of. History strongly suggests that anything people *can* do, somebody, sooner or later, *will* do.

I've also heard people assure them-

*Yes, I know that in the strict, original, biological sense, the word "clone" should refer not to an individual, but to the whole collection of genetically identical individuals related by any form of asexual copying. However, I also know of no better word in general use to refer to *one* of those copies, and this one has already come into widespread use in that sense—which some dictionaries have begun to recognize. So I, too, will use it that way.

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selves that it won't be done with people because "It's too hard." After all, these people point out, it took 277 tries to get the sheep named Dolly. Doesn't that prove it's too hard to ever become routine or be used on humans?

No, it does not. Remember that Dolly was the *very first* successful attempt, done using the most primitive techniques that will ever be available that produce any results at all. Saying that the limited nature of the success defines the ultimate limits of the technology is like saying that airplanes will never be of commercial importance because the Wright Brothers' first plane could only stay aloft a few seconds and fly a few yards. People *did* say that, and now others are saying quite analogous things about cloning. Their reasoning, and the conclusions they draw from it, are just as sound.

Not everyone immediately condemns the newly demonstrated potential. Some religions do, not surprisingly, but not all. Which is probably good, because it may not be long before some priest or rabbi or minister finds himself having to consider not just whether his church should approve of cloning in the abstract, but whether he personally should welcome a clone into his congregation. (Has anyone noticed, by the way, that the Biblical description of what was done with Adam's rib sounds an awful lot like cloning, with a little genetic modification thrown in?) At least one US senator, Tom Harkin of Iowa, has gone on record as saying, "Human cloning will take place and it will take place within my lifetime. I think it is right and proper. . . . It holds untold benefits for humankind in the future."

The trick, of course, is to get the benefits while steering clear of the dangers. I can't think of any past technology that didn't have the potential for both beneficial and harmful uses. I see no reason to believe cloning is an exception. Senator Harkins's quote at least sounds like a more realistic appraisal of the prospects than most I have seen so far. Everything we know of both history and biology suggests very, very strongly that human cloning *will* be done, and sooner rather than later—and that those who would protect us against its abuses had better get busy thinking about its ramifications Right Away.

To help them get started, I respectfully point out, again, that some people have *already* done a lot of thinking about these matters. Those just beginning might be well advised to start by familiarizing themselves with what's already been done.

Oh, yes—one more thing. We weren't kidding about rockets and space. We weren't kidding about cloning. We're not kidding about a lot of other things, either. Anyone who was shocked by Sputnik or Dolly might want to start reading a *lot* of science fiction, to reduce the likelihood of being caught so off guard yet again. ■

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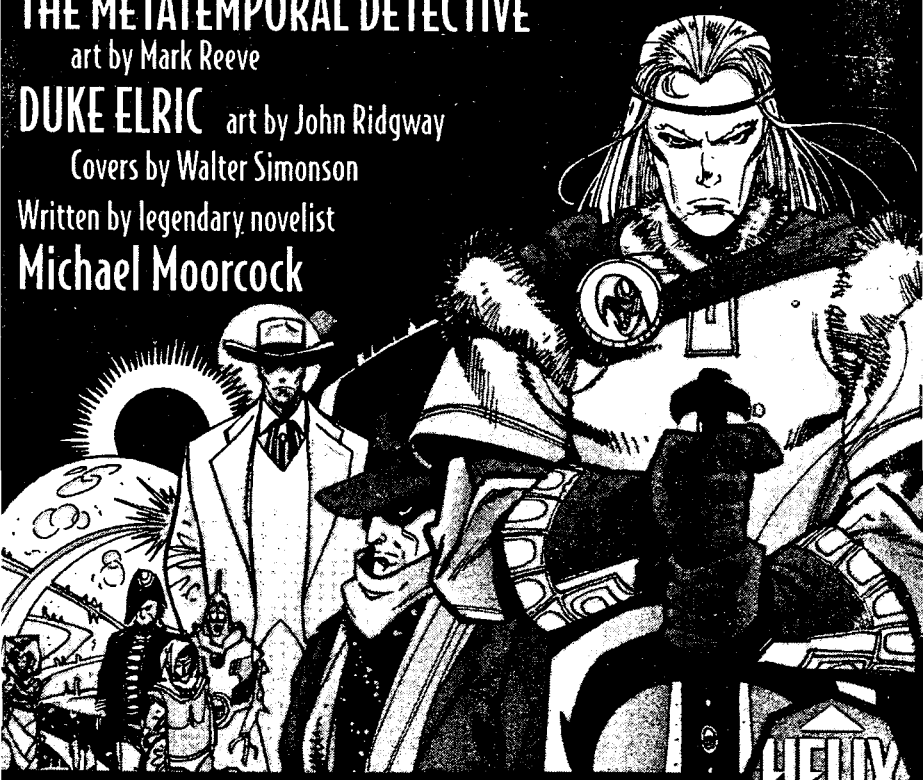

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Part One of Three

Frederik Pohl

O PIONEER!

Scarcity of real estate can make strange—and not necessarily eager—bedfellows.

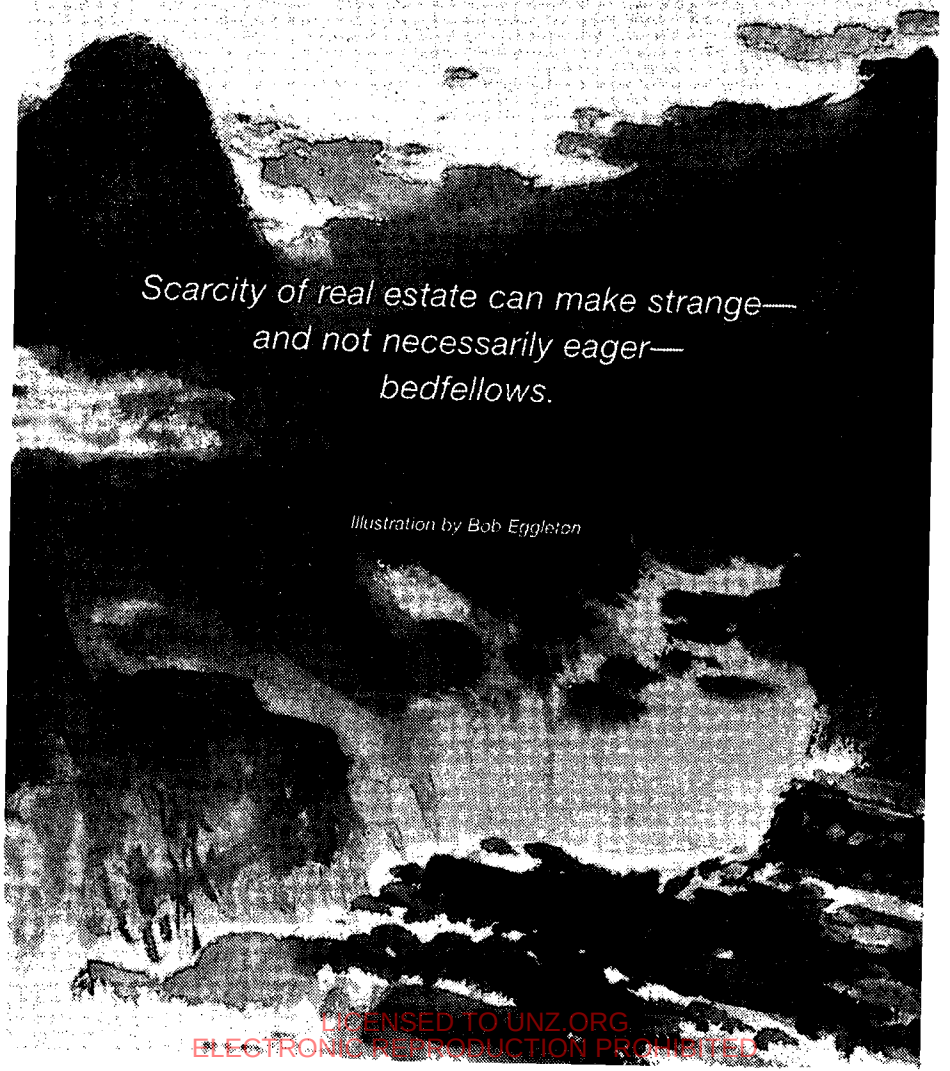

Illustration by Bob Eggleton

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Bal Harbor Residential Park. "Low Cost Luxury for the Discriminating Few. Fully retractable private residences, 100% soundproofed, payments in cash accepted. Kitchen and all conveniences nearby.

—Classified ad, "Residential drawer space to let."

Evesham Giyt's mailing address was c/o the Bal Harbor Residential Park, but he didn't use the address much. He practically never received any mail. He didn't expect to. He didn't even have a terminal, at least not one that anybody knew about. Certainly not one that had his name on it. Anyway, there wasn't anybody he'd ever known whom he had any interest in keeping in touch with. He had no living relatives. He had not retained any old friends.

Even if he had, Bal Harbor wasn't the kind of place you'd specially want people to know you were living in. Located in the industrial fringe of Wichita, Kansas, it looked more like a district of broken-down warehouses than anything you would call residential. About the only time Giyt mentioned that Bal Harbor was his home was when he was applying for a job as a bug-killer. That only happened when his money began to run out, maybe three or four times a year. That was because he had no choice, since employers always wanted to know where you lived. In this one rare case Giyt found that it was easier to tell the truth than to fake something.

What did have to be faked, of course, were his references. Giyt naturally wrote those himself, complete with net addresses that were keyed to divert any inquiries into one of his own programs.

However, Giyt's skills at bug-killing were very real, because Giyt was an absolute computer genius. In the first two or three weeks at any job he never failed to turn up and cancel a whole nest of the little nasties, some of them surveillance scout programs implanted by business competitors, some just the mischief of some harebrained hacker. Now and then, though, he turned up some really ugly time bomb that had been sneaked in by a bloodthirsty competitor or left as a parting gift by a disgruntled former employee—left, often enough, by the particular former employee Giyt was replacing. By the time that had been going on for a few weeks his bosses were invariably congratulating themselves over their good judgment in taking him aboard. So they always took it hard when, all apologies and sorrow, he told them the bad news about the sudden emergency in his family that made it necessary for him to quit and move to, say, Fargo, North Dakota, or maybe Key West. By then Giyt had also located some good and undetectable ways to divert a decent nest-egg to one of his own six or seven untraceable dummy accounts. Thus solvency was assured for the next few months.

The authorities considered that sort of activity seriously illegal. Giyt didn't agree. He didn't think that what he did was stealing. He thought of it as what it really was, namely making sure he got an appropriate payment

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for the really very valuable services he had rendered. Who was in a better position to calculate the value of those services than the person who had rendered them?

Giyt never embezzled large amounts. He could have, easily enough. It would have been no trouble at all to reach into some megabank's files and siphon away a few million cues before they noticed—by which time the money would have disappeared into one of his untraceable ratholes—and then he would never need to lift a finger again.

Giyt didn't do that. In his view, that would have been dishonest. He *earned* everything he took, and he didn't need large amounts, anyway. It cost very little to live in Bal Harbor. He didn't need to keep on living in a dump like Bal Harbor, either, but the place suited him. Evesham Giyt had a very rich fantasy life. He spent a lot of time in the history net, with people like Julius Caesar and Adolf Hitler and the Spanish conquistadors and Alexander the Great. It would be a lot of fun, he thought wistfully, to conquer the world, or anyway some good-sized piece of it. Something about as big as Canada would be nice, and he even spent a number of pleasurable hours rummaging through the secret defense files of both the United States and Canada to figure out just how you could go about it. It wouldn't be all that hard. The only question was where to invade. Vancouver was a tempting beachhead. It would fall quickly, and then it would be hard for the Canadians to reinforce across the Rockies—but by the same token it would be a poor jumping-off place for invading the rest of Canada. He considered upstate New York, too; you could start by driving into Quebec, perhaps enlisting the more radical Francophones as guerrilla troops. But, taking one thing with another, he favored striking right across the northern tier into the prairie provinces, with their open terrain so marvelous for tanks.

It was fantasy, of course. Nobody fought actual wars any more, war of conquest or any other kind. Especially not the kind that involved killing and maiming. The Earth's big battleground was commerce—an extra import tax here, some merchandise dumping there, a lot of juggling exchange rates everywhere. There were plenty of people who yearned for the good old gory days, but Giyt wasn't one of them. In old-style wars he could have been a Napoleon, at least a Patton, but he didn't want to fight. Not actually. Only in daydreams.

Anyway, all the places Giyt might have wanted to invade, given a few army corps to help the job along, were pretty well messed up by the inroads of civilization. Urban crime, drug cartels, street violence—who needed that kind of problems? Not to mention that if you really wanted to physically conquer any sizable chunk of real estate in the way the old guys had, it would require a lot of—well—killing.

That was a stopper, right there.

Killing people had never been Evesham Giyt's style. He had no desire to hurt or enslave anybody. Not *any* person, much less the large numbers of persons that would die if you used

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those unpleasant mass-destruction weapons that made up modern warfare. The fact was that Evesham Giyt didn't like guns.

Guns, or at least one particular gun, were the reason why Giyt hadn't had any living relatives since his first year in college.

That was the year when his father had taken one of his carefully maintained guns from his private and highly illegal weapon collection, and used it to blow his brains out.

That had been a watershed event for young Evesham Giyt. As a small child he had adored the old man, who was a skilled and highly prized technician in the field of parts assembly. The older Giyt was not only an important employee in the little boutique factories that hired his services, often enough he was nearly the only one.

Sometimes, when Giyt was little, his father would take him along to watch him work. Evesham was fascinated by the way his father would sit there, patient and smiling, while his helpers dotted his wrists and fingers with tiny, almost invisible reflective patches. When he was fully marked he would sit before the bunch of parts he had laid out on the workbench and, as he had practiced, put them quickly together into the finished product—whatever the finished product for that day's run might be. Harriman Giyt only had to do it once. As he worked, the lidar scanners of the factory computer system registered each step. When he was finished the computers had only to repeat each step as many times as required for the run of the product—seldom more than a couple of thousand pieces, not enough to go through the bother of writing a program.

It was a good living for the old man and his young son, until the computers got a little more efficient. When all-purpose assembling programs had become capable of reverse-engineering a finished product and going back to work out the steps needed to put it together for themselves, Harriman Giyt abruptly found himself as unemployed as the piece workers he and the robots had replaced.

That was when he shot himself.

The effects of Harriman Giyt's suicide on his son were threefold. First, young Evesham discovered he had been left with no money to finish college. He had to figure out a way of tricking the university records systems into believing that his tuition had been paid. He turned out to be pretty good at that sort of thing, which naturally led to his later career.

Second, he resolved never to find himself in his father's position, which meant he never intended to depend on a salary for his livelihood. And, third, he acquired that lifelong distaste for guns—for, as a matter of fact, every one of the cunning devices human beings had invented to end the lives of other human beings. All of them. Way back to the most primitive. Clubs were bad enough, swords worse. With the emergence of catapults and arrows things got worse still, because now they could kill each other at a distance. And then, starting somewhere early in the 19th century, things got really bad. Rifles. Machine-

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guns. Bomber planes. Guided missiles. Tricky devices like the bus that could fly around a corner and shower needle-pointed flechettes on people who had thought they were perfectly safe from harm . . . well, it was all nasty, and the thought that those were the tools of conquest took a lot of the pleasure out of some of Giyt's favorite daydreams.

Anyway, it wasn't their battlefield triumphs that he most envied about the great conquerors of the past. It was something quite different.

All those wickedly villainous heroes had something Giyt didn't have. They had attainable goals. They knew what they wanted to do with their lives—never mind that the way they did it would cause a lot of unhappiness for the people they did it to. While he, really, had very little idea of what to do with his own.

Military conquest, for Giyt, was only a daydream. He knew it. He would have settled for less—for example, for some untamed wilderness where he could buy himself an estate with some of the reserve money from his hidden accounts. *Buy* the estate. Not kill for it. And then he would clear the land and plant his crops and be a genuine pioneer.

Unfortunately, Giyt couldn't find the right kind of place. There were plenty of wildernesses on Earth, sure, but they all suffered from one (or more) of three disqualifying traits. Either they were already chockablock with people so desperately poor that the neighbors would take all the fun out of pioneering. Or they were burdened with unpleasant disease organisms. Or the climate was nasty.

So he contented himself with what he had. Which, really, was not all that bad. Here in Bal Harbor he had a decent cubicle to sleep in, and all the appliances he wanted, and the finest food the city of Wichita had to offer any time he chose to go out to eat. He had his unregistered terminal. Sometimes he used it to roam the net, or created a scout program to roam it for him; something armed with key words to check out and one of Giyt's own sniffer programs to watch for defensive bugs. It was very easy to find secrets that way. Sometimes Giyt thought it might be interesting to write a book that exposed some of the political sins his scout discovered for him; but he never held onto that thought for very long. The secrets of the real world were, actually, pretty boring, and anyway the real world was what Evesham Giyt wanted to avoid.

Giyt liked his solitude. He kept it secure, too. Once or twice it had been threatened—most severely of all, long before, when he had been surprised by an intrusion on his screen: "Hey, warmonger! I liked your Canadian invasion plan. Ever think of doing it for real?"

Giyt didn't reply to the unknown hacker, of course. He didn't use those access codes again, either; he doubled his cutouts, and he never heard from that person again.

Put all those things together, and Giyt had just about everything you could want to make life bearable . . . but that wasn't all.

He also had Rina.

Rina was a very big plus in Giyt's

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life. Rina was lively, pretty and dark, a tiny woman almost half a meter shorter than Giyt himself but twice as energetic. She was also crazy about Evesham Giyt and she was absolutely wonderful in the sack.

That last part, he supposed, was one of the fringe benefits of her early training as a hooker, although she had explained to him very soon in their relationship that she had specialized in whips-and-chains domination because that way you didn't actually have to screw any customer you didn't really like. Probably she thought telling Giyt that would ease any jealousy he might feel. She needn't have worried, Giyt didn't mind any of that. Sometimes Rina would shyly suggest that handcuffs would be nice for a change, and once in a while he obliged her for old time's sake. He drew the line at the whips and chains, though, and usually it was just nice, friendly, just-for-fun sex. They'd go out to have a good meal somewhere—Thai or Provencal for preference, because there were good places for both only a short autocab ride away. Of course it was generally Rina who paid the bill with her credit wristlet, and that was another nice thing about Rina. She never asked why Giyt didn't use credit of his own. She didn't have to. Obviously she figured out that Giyt didn't want to submit to being sniffed and thus identified in some databank somewhere. And, of course, he always reimbursed her in cash, with a little extra rounded off.

Then, when dinner was over, they'd go back to his slide and climb in. When the slide was retracted and the privacy locks put on they were all alone in their warm, pleasant personal place with the minibar and the climate controls, and whatever kind of music suited their mood from his library of fifteen or sixteen thousand pieces, and maybe a light show or a porn disk to get them started. Once in a while he'd even let her stay overnight, because her own cubicle was really pretty Spartan—Rina was living on savings while she finished her business-management courses at the Wichita campus of KU. Rina took her schooling seriously, too. She studied hard. She didn't really have to bother, because Giyt had showed her early how easily she could improve her grades by accessing the school's databank—for that matter, could award herself as many degrees as she liked, summa cum laude if she wanted them that way—and not go through the trouble of passing examinations at all. Rina caught on quickly. She had a natural ability for jiggling computer systems, but she wouldn't do any actual tampering and wouldn't let Giyt do it either. She didn't want good grades, she explained. She wanted to actually learn this crap. Didn't need to cheat anyway, really, because her grades were just fine. There was a moral issue there for Rina, too. That sort of thing was like Peeping Tom stuff. Which was too much like business. The former hooker had no interest in invading someone else's privacy.

So there was Rina, and all his other little pleasures, and it was a pretty good life, if sort of lacking in any long-range objectives. Giyt could not see any practical purpose in trying to

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change it . . . until the Tupelo recruiters came to Wichita.

II

Once again, this year's Nobel prize in physics represents a major miscarriage of justice. No doubt Drs. Morchan and Weng have done notable work in the field of high-temperature antiquarks. Nevertheless, the grandest scientific event of this century is plainly Fitzhugh J. Sommermen's discovery of a means of faster-than-light transportation. It is here. It works. How can the august members of the Nobel committee continue to pass it over for the prize?

Dr. Sommermen has given us a hint of how the process works. It is, he has told us, related to the well-known Einstein-Podolsky-Rosen Effect. In this litigious age in which we live, when scientists dare not speak freely about their ongoing researches for fear that some less scrupulous person will appropriate the fruits of their work and even patent them, we cannot yet ask for more. To deny Dr. Sommermen the Nobel award simply because he declines to make public all of the details of his work is shameful. Yet, truly, this great genius does not need a prize to validate his preeminence in his field. His work speaks for itself.

Editorial, The New York Timesnet

Evesham Giyt had heard of the Tupelo planet, of course. Everybody had. The story had been a headliner on all the news broadcasts fourteen years earlier, when the planet was first discovered by scout spacecraft operated by the Huntsville-based ET-DIXIE program and the word instantly flashed back to Earth by the amazing new Sommermen process. Giyt hadn't paid a lot of attention to the story even at the time. He wasn't actually much interested in news, but he hadn't been able to avoid seeing some of the stories when he was trying to check on the day's stock prices. Naturally, most of the interest in Tupelo had dried up fast when the next hot story came along to chase it off the headlines, but for some time now, Giyt knew, the Extended Earth Society had been doing their best to keep it alive with their commercials.

Of course, Giyt didn't pay much attention to commercials, either. When his blab-off cancellation programs slipped up and let one get through he generally just ignored it. This one, though, caught his eye—nice graphics, good background music, probably Holst's *The Planets,* but jazzed up with a tricky rhythm. He actually listened to what the executive-looking man in the briefs and sunscreen was saying. "Tupelo," the man declaimed, holding up a string of thirty-centimeter trout. "An unspoiled world! Begging for people to come and enjoy its magnificent climate, its sports opportunities, its endless beaches, its balmy breezes! And Ex-Earth can take you there *now.* Absolutely without cost! All moving expenses met by the Society! And you can begin the most wonderful vacation you can ever have, for the rest of your life!"

On impulse, Giyt pressed the key for the stats. The more he examined them the better Tupelo began to

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sound. It was undoubtedly the very best of the extra-solar planets anyone had yet detected even telescopically, much less actually visited: very Earth-like gravity, air and temperatures. It didn't have much land, of course. Only one piece you could call a continent in that immense, planet-wide ocean, and that one way up around the North Pole. But it had plenty of good-sized and comfortable-seeming islands.

And it was very nearly *empty*.

That was the part that intrigued Giyt the most. Tupelo was just about a perfect model of a world to conquer. Oh, not really *conquer*. Certainly not with guns and swords and armies. But still—

So before he could change his mind he set up an appointment, and an hour later he was in a suite in one of Wichita's best hotels, having coffee with a very affable man who was very impressed with Giyt's credentials. "You, Mr. Giyt," he declared, "are exactly the sort of person we want to send to Tupelo. Good health, no genetic negatives. And your socialization scores are, well, just *admirable*."

Giyt nodded modestly. He had been quite creative with his personal stats. The man was going on: "We seldom get an application for somebody with degrees in both agronomy *and* business management, not to mention your building skills."

"That was a long time ago," Giyt protested. "Just summer jobs on construction projects while I was at school, but I did seem to have a knack for it."

"I'm sure you did. About the only other thing I could wish for is a medical background—"

Hell, Giyt thought to himself. He could have set that up too while he was inventing the other credentials, if only he'd thought of it.

"—But, good lord, what can we expect from a single colonist? No, Mr. Giyt, you're perfect. I can inform you now: you're definitely accepted for the program. More coffee?" Then, almost as an afterthought, "Of course, we'll have to know something about your wife, too."

"Wife?" Giyt repeated cautiously.

"You do have one, don't you? You see, Ex-Earth doesn't just want *tourists* to come to Tupelo. What we want is *families*. I don't mean you can't come right back to Earth if you decide you don't want to stay on Tupelo," he added hastily, "but we don't think you will. We think you'll want to live your whole life on Tupelo, and your children and your children's children after you. Now, when can you bring her in?"

So when Giyt left the hotel he didn't go back to Bal Harbor; just crossed the street to the Kinko-WalGreenMart superstore and rented a terminal. He had an hour before Rina got out of her class, and that was plenty of time to do what he had to do. When he was finished the clerk goggled at Giyt as he pushed the ID-sniffer away and offered actual money in payment. But Giyt had a stock explanation ready for using cash: "Don't want my wife to see the bill," he said, smiling.

When Rina emerged from the school building, loaded down with palmtop and disks, looking like a very pretty schoolgirl, she was astonished

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to find Evesham Giyt waiting there for her. "Hey, Shammy," she said good-naturedly, "this is an unexpected pleasure. What's the occasion?"

"There's something I want to talk to you about."

"Really? What?" Then her expression changed. "Oh, Shammy," she said unhappily, "you're not suddenly *jealous,* are you? Sure, I have lunch with one of the guys now and then, but that's as far as it goes, and that's no reason for you to come down here to *spy* on me."

"No, no, it isn't anything like that. I just wanted to ask you something. How would you like to get married?"

She almost dropped the palmtop. *"Married?"*

"That's right. Married. You and me." To prove the point he displayed the printout of the back-dated license he'd got from the county clerk's program, absolutely indistinguishable from the real thing, even in the unlikely event that anybody would ever take the trouble to check back into the database.

She studied it for a long minute, standing on the street corner with the breeze whipping her hair. Then she looked up at him. "My God, Shammy, I never thought—I don't know if we're really ready for— It's a big— Tell me the truth, Shammy, no shit, do you really mean it?"

"You bet I mean it. And, listen, I have a really great idea for the honeymoon."

Rina said she wouldn't be nervous about being shot from one star to another in this newfangled Sommermen transportation thing, but Giyt thought she really was. *He* was. He got in and closed his eyes—and then, wonderfully, it was over as soon as it had begun; you stepped in the chamber on one world and stepped out of it on another, and that was all there was to it.

And Tupelo was just as promised. It was an Earth-sized planet, with perfectly breathable Earth-style air—which was what it more or less had to have, because none of the ET-DIXIE probes had ever found a life-bearing planet that didn't. And it had a *lot* of water. Just as described, it was mostly ocean, with the colony on a Sri-Lanka-sized island that was part of an archipelago in its temperate zone.

Giyt wondered about living on an island. He'd never done that, and it sounded, well, sort of confined. He had to admit that it was a nice island, though. It had everything the recruiter had promised. The island was built like a sombrero, with huge central peaks, the remnants of ancient volcanoes (but now, they swore, thoroughly dead), and the town they were to live in was on one of the series of broad plateaus that descended to the sea. Streams with pretty waterfalls raced down the mountainside to make Crystal Lake. The climate was ideal, sort of like a coastal Oregon spring. Their new home was within easy walking distance of the pretty, fresh-water lake that had, as promised, already been stocked with Earthly game fish. There was a fully functioning net, with a prime database that had been copied from the North American nexus itself; one subset was the complete Library of Congress

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base, so Giyt would not have to be without his favorite entertainment. There was a hypermarket, well stocked and promising to special-order from Earth anything they wanted that wasn't already on the shelves; there were beauty shops and an office depot with everything the Earth superstores had; and five or six small, but nice-looking, restaurants and bars . . . and all those things just in the services Ex-Earth had provided, with all the wonders of an alien planet to explore as well.

And then there was their home itself.

It had been a long time since Evesham Giyt had lived in anything that didn't pull out of the wall, like a file drawer. He was a little uneasy as they prowled their six rooms with one of the Ex-Earth resident agents. She was a woman named Olse Hagbarth, and it was her job (and, she said, her pleasure—and that of her husband-slant-colleague, too) to make all the new colonists welcome. "Of course," she said, looking around at the furniture with some disdain, "this stuff belonged to the previous occupant. Pity about her. She went back to Earth—homesick, I guess. You don't have to keep her furniture. If you want to replace it we can get you just about anything you want from Earth. And, listen, don't worry about spending your resettlement grant. There's more where that came from; Ex-Earth is *loaded*."

But Rina was happy with the furniture supplied, was happier than Giyt would have believed with the house itself, and with the queer, un-Earthly plants that grew in its modest garden, and with the kitchen and the bathroom that was all their own; and she couldn't wait until the agent left and they could try out their huge and comfortable new bed. "Shammy, Shammy," she murmured into his ear, "don't you think this is *wonderful?*"

It probably was, he agreed. Tupelo was everything they'd been promised.

The only thing was, in one or two unexpected ways it was somewhat *more* than they'd been promised, because the recruiter in Wichita hadn't said anything about the fact that five rather odd-looking races from other star systems were also doing their best to colonize it.

III

Come on, guys! Let's all give a big Tupelo welcome to Ms. and Mr. Evesham Giyt, just joining us in our little heaven in the heavens. Ms. Giyt was a college student back in Wichita, while Mr. Giyt was a network systems analyst and consulting agronomist. We're glad to have you here, Evesham and Rina! And listen, folks, don't forget that Maris Bretweller's square-dance treat is on this afternoon in Sommermen Square.

—Silva Cristl's siesta-time broadcast

The funniest thing that happened to Evesham Giyt on Tupelo was when he got elected mayor of the human portion of the community.

It was, Rina told him fondly, quite an honor for somebody who'd only been on the planet for five weeks. Giyt didn't think it was actually a *great* honor. He would be the mayor of only about eighteen hundred Earth

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humans. Nobody else seemed to want the job, and the previous mayor, Mariam Vardersehn, flatly refused to run again, because she wanted to stay home and take care of her newborn twins.

Still, it was an odd turn of events for the man who, for all of his thirty-four years, had resolutely paid very little attention to the problems of anyone but himself.

Getting elected mayor was pretty much Giyt's own fault. When Hoak Hagbarth, the male half of Ex-Earth's team of on-site facilitators, happened to complain that the tax, license, and record-keeping functions of the government were in a terrible mess Giyt incautiously volunteered to fix the programs. After that Hagbarth pointed out that it only made sense for the man who understood the system to be in charge of running it. "But I don't know anything about politics," Giyt protested, and Hagbarth punched his shoulder in a friendly way.

"Neither did Mariam when she got elected," he said soothingly, "and she did all right. You'll be fine. Anyway, you look like a candidate. Got that friendly dumb face, not too handsome, not really ugly, either. You look—I don't know, I guess I'd have to say you look *honest*."

"Yeah, thanks," Giyt said, rubbing his shoulder. Hoak Hagbarth was a big man, even by Giyt's own standards, and he was as strong as he looked. Giyt knew that he looked honest; it had been one of his most useful traits in the pursuit of his career, but Hagbarth didn't sound as though he meant it as a compliment.

"Tell you what," Hagbarth said, winding up the conversation, "why don't we just let the voters decide? Now I've got work to do."

As it turned out, the voters loved the idea. There was one vote for Albert Einstein, one for George Washington, and five for, succinctly, "Me." All the remaining 976 adult members of the Earth-human electorate cast their ballots for Evesham Giyt. It was a wonderful display of democratic consensus at work.

Mayoring didn't seem to be a very difficult job at first. Since Giyt had got the fiscal programs straightened out they pretty much ran themselves. For the first bit of time his only real duties were more or less honorary. He was expected to speak to the graduating class at the human school; that worried him a little, as he had had no previous experience in public speaking. However, there were only eleven graduating students so Giyt's public-speaking debut wasn't really all that public. Then, come Christmas, Giyt was the one who put on the Santa Claus suit and descended from a gyrocopter onto the soccer field where the giant community tree was winking its eighteen hundred (by then eighteen hundred and eighty-five) instrument lights, one for every human being on Tupelo. It happened to be a very sultry and rainy day, not Christmasy at all, but the human part of the colony was still resolutely sticking to the Earthside calendar. Giyt kept his ho-ho-hos short and got a big hand when he was finished, since everyone was grateful to be allowed to get out of the rain.

It wasn't bad. As a matter of fact,

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Giyt surprised himself by actually enjoying that sort of thing, once he got used to the idea of being *known* by everybody around. He liked the fact that all the humans greeted him as they passed in the streets—yes, and a good many of the eeties, too. At least Giyt *thought* the extraterrestrials were giving him friendly greetings, though unless he remembered to wear the earpiece translation phone their various slurps, squawks, chirps and gargles could have been anything.

Getting used to a new neighborhood—actually to a whole new *planet*—was pretty much an unprecedented experience for Evesham Giyt. He had never paid much attention to his physical surroundings. His real environment had always been electronic, and global, and didn't change simply because the location of his body had. But here he felt a real need to explore. Giyt had never spent so much time out of doors since the long-ago college days when his girl of the moment persuaded him to try jogging. He found he liked it. Liked to wander the streets of the town, enjoying the sight and scent of a human bakery next to a Kalkaboo soup-brewery—two very different smells—and watching work crews digging new sewers and putting up new houses. It didn't disturb him that so many of the workmen—well, the workthings—weren't at all human. What *really* surprised him about himself was that he even enjoyed going to the hypermarket with Rina to pick out towels and bed linen and kitchen appliances—Giyt hadn't even known that his bride knew how to cook.

The other big advantage of being mayor was that it solved the problem of stalling Hoak Hagbarth, who had been getting increasingly insistent that a man with Giyt's impressive (if fictitious) background in agronomy would be a treasure on the community farms. Not that farming required any very demanding physical work, because Ex-Earth was very good about providing automatic machines for all the colony's really hard labor. Nevertheless Giyt, who had never once in his life had the experience of working with his hands, was just as well pleased to be spared the prospect of beginning it now,

There was one part of his job, though, that he hadn't been prepared for. That was the weekly meeting with the heads of the five other Tupelo communities in the Planetary Joint Governance Commission.

The evening before his first meeting Giyt was sitting on his tiny front porch, overlooking the "decorative" clumps of spiky flowering plants, with a drink in his hand. From next door were the distant sounds of Lupe and Matya de Mir trying to get their brood ready for dinner. Apart from that it was more quiet than Giyt had ever known.

That was one thing you had to say about Tupelo. Other than the occasional whir of one of the electric carts going past—bumblebee drone for the ones he and most of the races used, mosquito whine for the roller-skate-sized ones used by the little Petty-Primes. And also the New Day firecracker ceremony from the Kalkaboos

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every morning, and of course the once- or twice-a-week thunder of the suborbital rocket taking off for the polar continent—well, at least *generally,* it was fair to say, Tupelo was wonderfully noise-free. Certainly it was not at all like Wichita. Once you got used to its awkward thirty-four-hour day and the occasional drenching rain (and Giyt was pretty sure he would get used to them, sooner or later) it was, actually, not bad. Giyt wasn't prepared to go much farther than that. Rina evidently was, though; from inside the house he could hear her singing to herself as she made dinner.

The singing got closer and stopped as Rina came out, wiping her hands on her apron. "The pot roast'll be ready in about an hour," she announced. "Who's that coming?"

One of the electric carts had rounded the corner and was drawing up in front of their house. A man came out, consulting his memo screen. Giyt had seen him before, when they arrived: as big as Hagbarth, with a spade beard, named—Tschopp? Wili Tschopp? Something like that. "Got your order from the hypermarket, missus," the man said, looking Rina over in a way that Giyt was surprised to find he didn't like. And then he turned to Giyt. "You weren't at the terminal today when the new people came in," he accused.

"Was I supposed to be?"

"Of course you're supposed to be. You're the mayor, aren't you? So who's going to welcome them and all if you're not there?" He shook his head reprovingly, then returned his attention to Rina. "Where do you want me to put your towels and stuff, honey?"

Giyt answered for her. "Just leave them. We'll put them away ourselves." He hadn't meant for his tone to be quite so sharp. When the man had got back in his cart and driven away Rina looked at him curiously. "Are you feeling nervous or something, Shammy?"

"About what?"

"About this Joint Governance Commission thing, maybe."

"Of course not. What is there to be nervous about?"

She nodded, then said, "Listen, maybe we should stretch our legs before dinner's ready. I'd kind of like to watch the sun set over Crystal Lake," and he couldn't come up with a reason why not.

As they strolled, Rina looked up at him. "You don't really have anything to be nervous about, Shammy dear," she told him.

"That's good, because I'm not nervous," he said.

"Of course not, hon," she agreed, and began telling him the funny thing the eldest neighbor boy, eight-year-old Juan, had said about his mothers. At the shore of the lake they hesitated, then turned right, away from the town, heading toward the farm plots. Rina did all the talking. She had plenty to tell him, because Rina was blossoming in their new home; she had made several dozen instant friends, not only human but all over the community; had been offered a job she liked as receptionist in the beauty shop; was a volunteer Gray Lady at the human hospital when she was needed (which wasn't often, because

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the human community was a healthy lot and most of the hospital's beds stayed empty), was glad to take the neighbor kids to the beach when their mothers were busy. There was a time when Giyt would have found her steady stream of gossip irritating, because, really, what did he care if the general manager of the Delt colony had made a fool of himself by getting excessively high on hallucinogens at the Delt High Mass? Or that Lupe and Matya had weathered a serious strain in their marriage just a year ago, when Lupe thought for a time that Matya was getting a bit too involved with one of her co-workers at the Public Works office, who not only was clearly sexually attracted to Matya but was unforgivably a *man?* Now, though, he didn't mind Rina's chatter at all. He didn't really listen to it all, either, but he went so far as to pretend he did, for no other reason than simply that these things gave her pleasure.

It occurred to Giyt, as they strolled past one of the human farm plots (harvester machines neatly slicing ripe tomatoes and yellow peppers off their vines and trundling them to the storage building in town), that their relationship had changed since they arrived on Tupelo. He caught another glimpse of what that change had been when they reached the Petty-Prime allotment next along the shore. (Properly those particular eeties were called Petty-Primates by the human colonists—never mind what they called themselves—because they were little and they were definitely primates, more or less, but Giyt had already learned to drop the extra syllable.) One of the little pink-skinned, monkey-like creatures stopped his work of grafting a new branch on a juice tree and chattered a greeting to them. They had no translator with them so Giyt had no idea what the thing was saying, but he automatically bowed to the creature in response . . . until Rina, by his side, chattered a few syllables back and he realized the greeting hadn't been meant for him but for her. "Hell," he said, wondering, "when did you learn to speak their language?"

"Oh, Shammy, I never will learn it, really. Just a couple of words like, 'I hope you're having a nice day.' That's their chief agronomist who just said hello; his kids were playing with the ones next door and we got friendly. Are you feeling more relaxed now?"

He was more amused than annoyed. "Are we on that again? I'm not nervous."

"Of course not," she said comfortably. "After all, Mariam Vardersehn did it for two years, and anything she can do you can do better. . . . Oh, and Shammy? Did I tell you? I want to see if I can finish my college courses."

"Here?"

"Oh, yes. Olse Hagbarth says there's an extension program I can use, and Ex-Earth will pick up the tuition. Olse says I can even quit my job at the beauty shop because they'll throw in a stipend."

She looked as though she expected congratulations, so Giyt provided them. "That's wonderful," he said, patting her arm.

"Isn't it? I think I'll switch my major, though. There's not much call for a

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business management degree here."

"Good idea," Giyt said approvingly, and squinted at the sun now just at the horizon. "I think it's time we turned back." He put his arm around her shoulders as they started home, silent again while he tried to analyze just how he felt about all this. Rina had never before asked his opinion about anything she chose to do before she did it. Was that part of what it meant to be "married"? And did it mean that he was expected to consult her, too?

After dinner Rina fixed him a hot toddy and went off to her studies. Giyt sat down at his terminal for some real relaxing.

But, although he sampled some of his favorite programs—a really good documentary on Genghis Khan, another on Alexander's father, Philip of Macedon, almost as impressive a conqueror as his better-known son—what he was really thinking about was Rina. He was having trouble diagnosing this new feeling he seemed to be having about her. It wasn't exactly "love." There was no change there. He had recognized some time earlier that he probably loved Rina, more or less, within the general meaning of the term as he understood it.

This was something else. It wasn't merely friendship, either. He came to the astonishing conclusion that it was largely, of all things, *pride*. He was proud of the way his, ah, his *wife* was making such a wonderful and rapid adjustment to this bizarre new place he had brought her to.

It took him a while to identify the feeling, because it was so unfamiliar to him. Giyt could not remember that he had ever before been proud of any other person in his life.

IV

The institution of the Joint Governance Commisston was older than the presence of Earth humans on Tupelo—or on the Peace Planet, depending on who was doing the talking. In the pre-Earth days there were only five races to jointly govern, and they met in a five-sided building. That one was now downgraded to serve as a storage facility for farm produce, as the admission of Earth humans required a new building. Not all the Earth humans were happy about what had happened. It seemed to some of them, especially the most patriotic of the Americans, that there was a subtle insult concealed in the fact that the Pentagon had been turned into a root cellar.

—Britannica on-line: "Tupelo"

The Hexagon—the place where all six of the colonizing races, human and eetie, got together to talk over whatever interests they had in common and, in particular, to stop disagreements before they got started—was larger and fancier than Evesham Giyt had expected. Each species had its own special place—chairs for the bipeds, a pretty little artificial tree for the Kalkaboos to perch in, a kind of couch for the Centaurians, and a two-meter-long cushion with internal plumbing to keep it warm and damp for the use of the Slugs.

As Giyt walked in for his first meeting all five of the other leaders rose to welcome him—the ones that were

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physically able to rise, anyway. There was an unexpected spatter of applause from the eight or ten people, almost all humans, sparsely occupying the chairs and chair-equivalents that were set aside for the audience, at such times as there happened to be one. The Centaurian female—the translator in his ear gave her name as Mrs. Brownbenttalon—was taking her turn in the regular rotation as president for the week, and so she made a speech of greeting. Of course Giyt could make nothing of the squeaks and squeals that came from her pursey little mouth, but his translation phone duly rendered it for him in English—well, more or less English: "The total of us who are not from the planet Earth human are overcomely delighted, Large Male Giyt, to have you participate us in our unceasing struggle to insure no hitting and the getting of along." *To insure peace and friendship,* Giyt corrected for himself, thinking it wouldn't hurt to take a look at those translation programs.

She went on from there, giving Giyt time to look around. He had never before seen all six of Tupelo's colonial races in the same place. Mrs. Brownbenttalon, whose Centaurian title was Divinely Elected Savior, looked more or less like a curly-haired anteater, nearly two meters long as she crouched on her cushions. Mr. Brownbenttalon, her main husband, was a tiny thing the size of a chipmunk, and he was crawling around in her fur and whispering in her ear as she spoke. The Delt General Manager was listening intently, sucking on his fingers—maybe, Giyt thought, because of embarrassment over his recent behavior at the mass. In the doll-sized armchair of the Petty-Primes their Responsible One was lackadaisically sprawled and staring disinterestedly at the ceiling. The High Champion of the Kalkaboos was tucked into a fork of its tree, but listening intently with its immense elephant ears. And the Principal Slug was, well, a slug; and if it was showing any sign at all of what was going through its mind Giyt could not detect it.

When Mrs. Brownbenttalon finished her speech Giyt, feeling foolish but nevertheless obliged to do it, offered a few words in response. All he said was that he was honored to be selected and hoped he would do credit to this body that was responsible for maintaining order on Tupelo. Giyt knew it wasn't a particularly great speech. He didn't expect an ovation, but all the same he was surprised at the chill of the response. The Delt took his fingers out of his mouth to peer at him reprovingly, and even the Slug twitched.

But no one said anything, and then Mrs. Brownbenttalon got down to business. She reported to the Commission that the power plant on Energy Island, six kilometers across the strait, was going to need expansion and each home planet would be required to supply funds and materials for the job. Additional farmland had been cleared on the far side of their own island, and each race was entitled to 3.962 hectares for its own purposes, the particular allotment for each to be determined by a random drawing—after which, of course,

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they could swap back and forth as much as they liked. The weather satellites had detected no approaching storms large enough to require special precautions for at least the next few weeks—and all this information, she pointed out, was in their datastores already, so if they would simply move to accept the reports as rendered? They did. Then she paused, while Mr. Brownbenttalon whispered urgently in her ear, and twisted around to look at Giyt. "Great misery I have," she declared, "for necessity disimproving your nuptial night participation with irritating complaints, but Delta Pavonis guys raise problem of conflicting interests. You speak now, Delta Pavonis guy."

The Delt took his fingers out of his mouth again and began to bark at Giyt. Giyt was willing to do his best to get along with these alien freaks, even the Slugs. But he couldn't honestly say that he cared much for the Delts. For one thing, he thought they were unnecessarily ugly, with the pop-eyes that stared out in all directions from the top corners of their inverted-triangle heads (did the first humans call them Delts because of the name of their star, or for the Greek-letter shape of their faces? Giyt didn't know). The Delts also smelled, well, distinctly *rancid,* even in the thoroughly air-conditioned confines of the Hexagon. And they had the reputation of being a nuisance.

Which last trait the General Manager acted out for him now. The Delt translation program was little better than the Centaurian, but Giyt was able to figure out what the Delt was complaining about. It seemed that those steelhead trout Ex-Earth had stocked into Crystal Lake were eating the copepods the Delts had planted there, and no proper Delt could enjoy his dinner without a copepod garnish to give it taste. Something had to be done, the General Manager declared. Instantly. If not absolutely at that very instant, then certainly pretty damn soon, because all the Delts were suffering greatly from their deprivation.

The Delt was doing his best to make Giyt suffer, too, because he went on and on about it. Giyt took some comfort in the fact that the other commissioners were paying very little attention to the Delt's complaints. Mrs. Brownbenttalon was whispering cozily to her principal husband as he perched just above her nose, the Kalkaboo was scratching its shiny pelt absorbedly, the Petty-Prime was studying its readout of reports, and the Slug was simply being a slug. And then, when at last the Delt was finished—or came to a breathing space in his oration—Giyt quickly promised to look into the matter, Mrs. Brownbenttalon immediately declared the session adjourned, and the audience applauded again as they all got up to go.

"You were wonderful," Rina told him at the door. "See? I told you it would be a breeze."

"Yes, sure," he said, abstracted, "but you go on home and I'll get there when I can. Right now I need to talk to the Hagbarths about this copepod business."

Hoak Hagbarth wasn't in his office, which was also the Hagbarth home, but Olse was there. "You did fine," she

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told him at once. "Want some lemonade? I make it myself, bring in real lemons from Earth. Oh, the meeting? Sure, we both watched you on the screen, but Hoak's gone fishing. The copepods? My advice is forget it. The damn Delts try that one every time there's a new mayor, but, really, it's all Delt crap. There's no problem. We've got sonic barriers to keep the trout out of the copepod breeding places—you know, the wetland shallows in the lake's bays—and if they do eat a few of the cruddy little things every now and then, who cares? There's always plenty left over for the Delts. You sure you won't have some lemonade?"

But that last question came from the kitchen, where Olse Hagbarth was already pouring him some. "Yes, thank you," Giyt called to her, accepting fate as he looked around their place. It wasn't any fancier than his own house. They did have a grand piano in the living room, but the rest of their furniture was, if anything, cheaper and less attractive than the stuff they'd furnished the Giyts. Nor did they have nearly as nice a location, half a kilometer away from the lakeshore, with no real view out their windows—unless you counted the rather hideous shape of a towering Petty-Prime barracks next door. So, whatever else the Hagbarths might do, no one could say they were pampering themselves at the expense of their charges.

When she came back with the lemonade Olse settled herself on the couch to face him, looking motherly and hospitable. "There's one thing," she said. "You called the planet 'Tupelo,' but the eeties don't call it that. They call it 'the Peace Planet.' They get bent if we don't."

"Oh, right," Giyt said, remembering. "I thought at the time I might've said something wrong—"

"Not *wrong*, for heaven's sake. That's what the ET-Huntsville people named it when they discovered it, and we can call it what we like, can't we? But the eeties get antsy if you don't go along with their name. As I guess you noticed. How's the lemonade?" When he had reassured her that it was fine, she added, "Listen, Hoak was thinking about something, if you're interested. Hoak thought you might want to take a look at some of the off-island facilities. You know, the power plant on Energy Island, that sort of thing? Or even the mines and things on the polar continent. He said he'd order you a chopper any time you want to go to the island. You'll have to take the sub-orbital to visit the mines, but you could go along when the next shift goes there. Or we could order a flight up there for you. Take Rina if she'd like to go; probably you'd both enjoy seeing more of Tupelo than this one island."

"Maybe so," he said, dazzled at the thought of having a high-speed sub-orbital transport ordered up for him any time he wanted to fly a few thousand kilometers away. "I'll talk to Rina."

"You do that, hon. And, listen, Hoak and I just want to say that you're doing a wonderful job, fitting right in the way you're doing. But that's our way, isn't it? I mean the Earth humans here. We pitch right in, don't make waves, don't start trouble for anyone—"

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"Like that Delt, you mean?"

"Including the Delts," she said, nodding vigorously as she stood up. "They're all eeties, so what do you expect? Anyway, come see us again, won't you? Maybe we'll have a little dinner party. Now I'd better get busy and try to catch up on our reports back to the home office."

On the way home, Giyt thought about the trip to the polar continent. He had no idea what it would be like. Cold, yes. According to the pictures he'd seen it was almost as ice-covered as Earth's Antarctica, and just as bleak. When he told Rina about the invitation, sure enough, she was thrilled. She was standing in their front yard, talking over the fence to Lupe from next door, with a couple of Lupe's kids splashing in their wading pool. "I'd love it, Shammy!" Rina cried, and Lupe confirmed:

"You will. Matya worked up at the Pole a couple of seasons, before the kids began to come, and I went up sometimes for weekends. It's nice. Great accommodations, and they have a really good health club—in the Earth human part, I mean. I guess the other people have all that stuff, too, but I never got around to seeing it. And, speaking of the kids coming—?"

She looked inquiringly at Rina, who shook her head. "I haven't had a chance to tell him yet. Come on inside and have a cup of tea, why don't you? You can watch the kids through the window."

What it was that Rina hadn't told him didn't get told just then, either, because Rina disappeared into the kitchen to make the tea for their guest. Leaving Giyt to be the gracious host. Since Rina liked the woman Giyt made an effort to be hospitable. Rina had told him all sorts of stories about the de Mirs. She had been charmed by the fact that they had invented a new surname to replace their old ones—so that, Rina said, they would all have the same name, and the kids would always be reminded of where they came from. So they had taken a word from each of their ancestral languages and made de Mir—from Earth.

Well, all right, that was somewhat charming, Giyt admitted to himself. But he had never been alone with either of the de Mirs before, and by the time Rina came back with the tea tray he had run out of subjects that did not touch on sexual orientation.

Lupe, too, seemed oddly embarrassed. She greeted Rina with relief. "And your stove's all right now? Shura used to have a lot of trouble with it, among other things, and Hoak Hagbarth just wouldn't get it fixed for her."

"It's fine. I think they put in a new one after your friend moved out."

But Giyt was not interested in a friend who had moved away; he wanted to know what it was that was hanging over his head. "There was something you wanted to tell me?" he prompted his wife.

Rina looked at her guest for an answer. "Well, it's just that I'm pregnant again," Lupe announced, flushed becomingly rosy. "We always wanted six, so we're almost there."

"Congratulations," Giyt said, since that was what she seemed to be expecting; thinking that for a pair of

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same-sex females they were certainly remarkably fecund, courtesy of Ex-Earth's sperm bank.

"Thanks, but what I wanted to say is that all of a sudden Matya is after me to quit being a volunteer fireman. Too much physical activity for a pregnant woman, she says. Which is nonsense. We don't have that many real fires, and even if we did . . . Well, that's between Matya and me, isn't it? Anyway, I'm going to quit, just to please her, and what I was thinking is that that means there'll be a vacancy in the fire company. So I was wondering whether you wanted to join."

He blinked at her. "Be a fireman?"

"Only if you want to," Lupe said quickly. "It doesn't take much time—hell, how often does anything burn around here? Not counting brush fires, I mean, and you only get those in the dry. In a couple of weeks we're having our annual firemen's fair, we're calling it 'The Taste of Tupelo' this year, and that'll take everybody in the company to man all the booths. But—"

"But you really ought to, Shammy," Rina coaxed. "As mayor. Set a good example. What do you say?"

Well, what could he say? He said yes. And, on their evening walk that night, did little talking, because he was wondering how it had happened that, without warning, the lifelong career computer thief and con-man, Evesham Giyt, was suddenly turning into a model citizen.

V

One thing about Tupelo that took some getting used to was its inordinately prolonged day. It wasn't quite thirty-four hours long, but the Earth-human clocks said it was—it was easier to deal with an "hour" that was only fifty-nine and a bit minutes long than to try to handle an odd fraction of an hour every day.

Sunrise was at ten hours. That's when Earth humans usually had a breakfast (actually, their second of the day) and started their day's work. At sixteen hours was lunch, then siesta until nineteen hours. Then the afternoon's work went until twenty-two hours, when it was customary to have a break for afternoon tea. Evening work was from twenty-three to twenty-seven hours, which was sunset. Dinner at twenty-eight hours; night-times free for whatever the persons wanted to do until thirty-two hours; then sleep. Since Earth humans hardly ever could sleep for more than eight hours at a stretch, they generally rose at six, had their first breakfast while it was still dark, and then were on their own until sunrise at ten. It made for a long day, to be sure. But, because of the midday siesta, it wasn't an exhausting one.

—"Getting Along on Tupelo" (Ex-Earth Guide for the Newcomers)

Time was, back on Earth, when Giyt might hear someone refer to an elected official as "a servant of the people" and take it as a joke. It wasn't a joke here, though. Here his constituents took it seriously. They called him on the net. They showed up on his doorstep. They buttonholed him in the street; and they all wanted something—sometimes a transfer to a

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different job, perhaps an increased line of credit at the hypermarket, even some private tutoring for the child that wasn't doing well in school. At first, most of the requests struck Giyt as easy enough to handle— "Actually," he would say, "that's not my department, you'd better talk to Hoak Hagbarth"—but then it turned out that a lot of the petitioners had already talked to Hagbarth, and Hagbarth had said no.

Habarth even said no to Mayor Giyt, when Mayor Giyt asked him about some of the petitions. "Take Knelton off the farm and transfer him to Energy Island? Hell, no! Listen, don't pay any attention to that bad back he keeps talking about; he just wants to sleep away his shift at the powerplant instead of running a cultivator. And how can we raise Gottman's credit limit past what the computer says he can pay? We plug in his income; we plug in his present debt balance; we plug in his past payment record. The rest is just arithmetic. Cripes, Evesham, you ought to know that for yourself; you're the guy who rewrote the programs."

It all made sense, once Hagbarth explained it. It was just a little surprising to Giyt to have Hagbarth say no to him, since he'd never said no before.

On the other hand, Giyt realized, he had never asked Hagbarth for anything before.

It wasn't just the endless demands for favors he didn't know how to give, either. The real time-destroyers were the endless extracurricular duties of a model citizen mayor. For instance, he was expected to show the flag when the Slugs had their annual eisteddfodd. That meant two hours of squirming in damp, uncomfortable seats in Slugtown, pretending to enjoy the sounds of the Slug choir baying and moaning at the bright Tupelovian stars. Well, it was interesting to see how the Slugs lived, in their mud huts just below the old dam on the far side of the lake. It made him wonder why they chose to live by themselves instead of bunking in higgledy-piggledy with all the other races, the way everybody else did. (But then the Slugs liked a moister climate than anybody else.) Rina sat loyally beside him at the sing, showing no signs of concern that her brand-new boots were getting all muddied up. But she did mention to Giyt her interesting observation that, although half a dozen other Earth humans had gamely showed up for the event, neither of the Hagbarths were among them.

Then there was the business of the volunteer fire company. Lupe insisted on taking him to the station herself so he could meet the others. Unpleasingly, the fire chief turned out to be that general handyman and admirer of Rina Giyt, Wili Tschopp; Giyt knew that it was unreasonable to take offense at the way the man looked at Rina. Lots of men had looked at her that way, back in Wichita, and it had never bothered him. Still, it made him uncomfortable in Tschopp's presence, and then, as soon as he entered the firehouse, one of the other men buttonholed him to ask why he and his family couldn't be transferred to the north polar mines on a permanent basis; it was cooler there, the man explained, and his wife really hated hot

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weather, and what was the use of having a damn mayor, and one, he pointed out, that he personally had voted for, if he couldn't get a little help from the man now and then?

Giyt promised to think about it. He knew he would, too, because he was already thinking, a lot, about these endless requests.

The firehouse was interesting, though. Giyt was impressed, not to say amazed, by the mass of heavy-duty fire-fighting equipment the company possessed: three great tankers, four pumpers and a chief's car. "But what burns here?" he asked the chief. "I mean, everything I see is fireproof, isn't it?"

"Brush," Chief Tschopp said succinctly, opening a beer. "Want one?"

Giyt didn't want any beer, exactly—he would have preferred a decent white wine—but he took the beer and listened to the chief's stories about how when the droughts came they turned the chapparal and the stubble in the farmlands on this side of the mountain into tinder. That made sense, though it had never occurred to Giyt that the island could ever suffer droughts. But the important thing was that Tschopp seemed to be doing his best to be friendly; and when the company voted Giyt in that night (Lupe told him later) it was Chief Tschopp himself who made the nominating speech. All the same . . .

All the same, although each of the little new drags on his time was reasonable enough, and maybe even kind of fun—Giyt was actually looking forward to the time when he himself might be driving one of those huge pumpers to a fire—there were a *lot* of drags on his time.

Giyt wasn't used to that. He'd devoted his life to making sure nobody would ever be in a position to tell him that he had to do this or that at such and such a time. He'd made it happen that way, too, if you didn't count the times when he rented himself out for a few weeks as a master debugger. Even then those times were short and he could quit when he liked.

Here it was different. Here there was always some duty he was supposed to perform, and some of those duties took actual *work*.

The fact that it all took time meant there wasn't much time left over for his former hobbies. Rina noticed that when, digging through the datastores for her schoolwork, she stumbled on an old TV series that she knew he would like. It was so old that it was just flat pictures, and black-and-white at that, but it was a documentary of Oliver Cromwell subduing the rebels in Ireland. But then, a day or two after she'd given him the locator data, she asked him how he'd liked it. "Haven't had a chance to look at it," he confessed.

"But I thought I saw you—never mind," she said sunnily. "What would you like for dinner?"

She really had seen him sitting before the screen, watching something or other; but it wasn't his usual fare. For the first time in his life Evesham Giyt had become a news addict; it was the only way he could hope to understand what his constituents were going to ask of him. Tupelo news came over the net and it was de-

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livered by a sharp-faced, honeyed-featured woman Giyt recognized; her name was Silva Cristl, and she was a lieutenant in the volunteer fire company. Tupelo news wasn't much like the stuff he'd avoided in Wichita. There were weather reports, introductions of new arrivals, personal messages (the Dunbay teenagers offering baby-sitting services, the Carlyles wanting to know if anyone else was interested in Zen chanting), once in a great while an obituary, details of who was in the hospital, new births, standings in the bowling league—well, there was all sorts of stuff there, delivered in Silva Cristl's hokey jes'-folks dialect. It didn't matter if you got interrupted in the middle of it. Giyt hated having someone bother him when he was in the middle of a good story of some exciting conquest, but with this stuff there was no problem.

When he found out all five of the other races had their own equivalent news programs he tried to access them as well. It didn't work. He got only garbage. Each eetie race had its own transmission codes, and none of them were in the least like Earth's.

That was a tough technical problem to solve, or would have been for anyone else. For Evesham Giyt, however, it was just a matter of decryption and that was the thing he was really good at. It took him a while to solve the basic protocols that went into Petty-Prime electronic communication, but he did it . . . and was rewarded with what appeared to be an installment of an interminable Petty-Prime soap opera. And then, while he was trying to puzzle out just why the two young males were refusing to mate with the older female—who already seemed to have several husbands, all of whom were urging the males to take her on—he heard Rina call his name. "Shammy? Aren't you supposed to chair the Commission meeting today? You don't want to be late for it, do you?"

He wasn't late in arriving at the Hexagon. But he wasn't really ready for it, either. As he called the meeting to order he realized he hadn't read over all the department reports so he could summarize them for the other commissioners. Besides, he was still a little worried about the Delts' copepod problem.

But the Delt General Manager accepted without demur Giyt's promise that the matter was being looked into, and, actually, it was the Kalkaboo High Champion who made the only fuss of the day.

Even in this whole zoo of weirdly designed extraterrestrial beings, the Kalkaboos struck Giyt as being pretty much excessively weird. They were vaguely primate in shape. That is, they had two arms, two legs and a head, though the head looked truly bizarre with those enormous ears flapping around it. But they looked more like skeletons than people. They seemed to have no body fat at all; and their skin glittered with metallic scales.

Which, Giyt learned, were actually some sort of photovoltaic cells, and what the Kalkaboo High Champion was pissed off about was that their perfectly reasonable requirement for a

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new and larger radiation house to soak up ultraviolet in was being deferred because of the need to conserve power. It wasn't anyone's fault that Tupelo's sun was deficient in the intense far-UV radiation they liked, the High Champion admitted. On the other hand, it was definitely everyone's fault that they were wastefully burning up so much electrical power for their own frivolous purposes that none could be spared for this urgent requirement of the Kalkaboo horde. The most wasteful people of all, he pointed out, were the new immigrants, of whom so *many* continued to flock in.

As one of the new immigrants, Giyt knew who the creature was talking about. What he didn't know was what to do about it. It was the Principal Slug who came to his rescue with a proposal. Each race, he suggested slobberingly, should make a survey of its power consumption and at the next meeting come in with plans for reducing their demand. On a strictly temporary basis, of course. Until the added generating capacity was on line. He expressed confidence that there were plenty of reductions that could be made without seriously discommoding anybody, and then perhaps the Kalkaboos could have their new radiation chamber right away.

Moved, seconded, and passed; and then, surprisingly, the meeting was over.

Giyt hurried out of the Hexagon before anybody could raise any more problems, feeling he had dodged a bullet. He didn't like the feeling. He needed to get ahead of these problems, and the way to do that was to have a talk with Hoak Hagbarth.

He found Hagbarth at the EPR terminal in Sommermen Square, but—Wili Tschopp explained—if he wanted to talk to him about this power-conservation matter he would have to wait. "It's Cargo Day, for Christ's sake," Tschopp told him. "Hoak has to be in the control loop."

"Control loop?"

Tschopp looked at him without patience. "The keys to the portal. Every race has a key. The portal can't operate unless all the keys are used, didn't you know that? So you'll have to wait. Just stay out of the way."

Giyt had seen the great portal before, of course—in fact, he had come through it himself with Rina, because how else could you travel the vast distances from Earth? But he'd never seen it from outside with power on, when it was already wreathed in the golden glow of what he had learned to call the Einstein-Podolsky-Rosen field and thus was ready to receive a transmission from Earth. Inside the chamber Giyt could see crates of merchandise ready to ship. He knew what they had to be. At the polar factories the Earth colony had a small production line that turned out various kinds of toys, trinkets and knicknacks to export to the home planet—nothing very valuable, but, Giyt supposed, every little bit that helped offset the cost of the Tupelo colony was worth having.

The thing that struck Giyt as curious was the number of non-humans at the terminal. Five of them—and Hag-

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barth—were seated or slumped at workstations around the terminal. That made sense. As Wili Tschopp had explained, there was this rule requiring all six races to be present whenever the terminal was operational. But there were at least one or two others present of each race, and what could interest them about a purely Earth matter?

He got the answer in a moment. There was a blue-and-white warning flare; then a faint hand clap of air as the stacked merchandise disappeared; a moment later a gentle puff as the export crates were replaced with others. At once the non-humans descended on them, opening every crate and peering inside. It looked like a customs search to Giyt, and then recognition clicked in his mind. It *was* a customs search. The non-humans were looking for contraband, and they were being damned thorough about it. Wili Tschopp was protesting vigorously, but the eetie representatives were insisting on opening every carton.

Hoak Hagbarth abandoned his post at the controls and, yawning, strolled over to where Giyt stood. Giyt blinked at him. "That doesn't bother you, what they're doing to the shipment from Earth?"

"Naw. Those guys are always like that. Look, Wili said you wanted to see me about something."

"Oh, right." Giyt was still staring at the commotion before him; a Kalkaboo had opened a crate of chiplets, the microcontrollers that ran most devices, and Wili was profanely urging him to be careful, while the Slug and a Delt were pawing through containers of personal goods meant for various human residents. "It's this power rationing thing. The Kalkaboos say—"

Hagbarth sighed. "I heard all about what the Kalkaboos say. Same old crap; don't sweat it. I'll cook up some kind of an airy-fairy program for you before the next meeting. Nothing that we need to take seriously, of course."

"But if the Kalkaboos really need the power—"

Hagbarth chuckled unpleasantly. "Need it? Do you know what they need the power for? They use UV radiation to get high. You see how they go around naked here, with all those little photocells on their skins? Well, they don't do that on their home planet. They'd be buzzed from the radiation all the time, so there they go covered up totally. When they have a party they take off all their clothes and get smashed from the ultraviolet."

"Oh," Giyt said, abashed. But as he turned to leave Wili Tschopp came toward him, grinning, with an opened carton in his hands.

"Might as well take this with you, Giyt," he said. "It's for your wife. I always said you were one lucky guy."

Giyt looked after him, puzzled, as the man walked away, chuckling. Then he looked into the carton and understood. It was a selection of chains, handcuffs and a fancily pink-wrapped packet of what the label called "marital aids." And, yes, the whole box was addressed to Mrs. Rina Giyt.

VI

We have established that both the so-called "Centaurians" and the so-called "Slugs" come from planets

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which orbit the star Alpha Centauri, and that the so-called "Delts" come from the system of the star Delta Pavonis. The provenance of the other two extraterrestrial races remains unknown. They decline to respond to any questions on the subject, nor have our searches turned up any data which would resolve it.

It is a noteworthy fact—it cannot be called a coincidence—that the automatic probes dispatched by the Huntsville Group to both of the above stars have lost contact even before they established circumstellar orbits. Analysis indicates a very high probability that these losses were not due to equipment malfunctions or accident. This leaves only one reasonable explanation.

—Internal communication Expanded Earth Society

Marked: Do not disseminate outside of Society.

When Giyt gave Rina the package she was a little irritated, a little amused, a little bit hurt, too. She stood there with her palmtop in one hand and her shoulder bag in the other, just getting ready to go out, looking both startled and disappointed. "But I didn't get those things for *us*, Shammy!" she said. "I wouldn't try anything like that on you; would I? I know how you feel about them. I ordered them for Lupe."

"Lupe next door?"

"Do you know any other Lupe? She was afraid that when she gets real pregnant, you know, Matya might not be so interested in her any more."

"Oh." Giyt cast around for something to explain his jumping to a wrong conclusion. "I just didn't know that women went in for this, ah, this dominatrix kind of thing."

"Well, they do," she said firmly. "Anyway, some women do. When I was in the game I had quite a few female clients, you know. It was pretty hard work sometimes, but they were mostly good tippers." She went back to stowing her gear in the bag, and when she spoke again the subject was clearly changed. "I think I'll see if Lupe wants to take a run down to the store and see what came in this time. Do you want to come along?"

Giyt didn't. He said he wished he could but he had work that he had to do, which was no more than a faint tincture of truth in a solid lie. The main truth was that he did not want to see Lupe just then, because he did not want to find himself speculating on just what it was that she and Matya did in the privacy of their bedroom. Much less on what Rina had had to do, in the old days, to earn those good tips.

The tiny tincture of truth was that he did have a good many things to do, and nowhere near enough time to do them all in.

Giyt had never in his life wished for more hours in a day. He certainly didn't wish for them here, either, because the long Tupelovian day already possessed nearly ten more hours than the Earth norm. That was one of the problems. The daylight hours were easy enough to deal with, especially because they were quite pleasantly interrupted by the after-lunch siesta. It was the night that was disorienting.

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You went to sleep in the dark and, because you couldn't sleep much more than eight hours at a time, no matter how hard you tried, you woke up in the dark, too.

Still, those four or five hours between wake up and sunrise were precious. People didn't call each other then, or come to visit. The work day didn't begin until the explosion of Kalkaboo firecrackers announced the dawn, and so Giyt had those hours for his own.

He used them for uninterrupted work. For trying to read all the reports that no one bothered to read at Commission meetings, and then for trying to catch up on all the things he didn't know about Tupelo and his new life.

There were enough of those things to use up a good many of those valuable morning hours—things like learning the planet's geography, identifying the various kinds of work that kept the Earth-human community occupied, trying to figure out the nature of all those bizarre extraterrestrials who had suddenly become his townies. Well, learning *everything*. All that stuff was in the data banks, of course, but it was still a lot to try to learn in a hurry. And then there was all the new information that kept coming in every day, four times a day, from Lt. Silva Cristl's newschat programs on the net.

The trouble with the lieutenant's news broadcasts was that almost everything she said raised new questions faster than it answered old ones. Like the late-night roundup when she announced, with almost a wink and nearly a grin, that she and a deputy had arrested four teenagers for being drunk and disorderly on the lakefront beach. Well, fine. The wink and grin were because Silva Cristl liked gossip, no puzzle there. But what was a fire-company officer doing arresting anyone? Giyt had to go back to the datastore to find out that, as the volunteer firemen were the closest the Tupelo humans had to a law-enforcement agency, they were also charged with performing what few police duties were ever necessary.

That made Giyt's eyes go wide. He himself was a volunteer firemen. So that meant that he had power to arrest wrongdoers—a most unusual situation for a man who had for most of his life been more likely to have been the one who was arrested.

Trying to keep all this new information straight was a lot of trouble. The things that Giyt felt he had to do kept getting in the way of the things he wanted to do, and Evesham Giyt wasn't used to that. It wasn't the work he minded. Giyt thrived on work, but the kind of work he thrived on was the heady challenge of matching wits against the best security programs anybody had devised, or solving some tricky problem in the net someone else had given up on.

Of course, there were a few tricky problems waiting for him if he ever got around to them—fixing up those crappy translation programs, for instance, or maybe taking the time to solve the protocols for the Slug and Centaurian and all the other alien communications systems. But that was just another kind of drudgery. Protracted drudgery, too, because any of that would take a *lot* of time; just

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writing a conversion program for net belonging to the Petty-Primes had used up several of those priceless predawn mornings.

Giyt almost longed for the old days in his Bal Harbor slide, when he could daydream or scheme for the conquest of Guatemala or Thailand in as much detail, and for as long, as he liked, with no constraints on his time except the ones he imposed on himself.

Actually, Giyt did manage a little of that. It came from his tap into the Petty-Prime system.

The things that Giyt saw when he looked in on the Petty-Primes weren't all that interesting in themselves; in fact, they were almost always either hopelessly confusing or terminally dull. The Petty-Prime local news programs were even less interesting than the humans. Perhaps the Petty-Primes themselves thought so, too, because most of their transmission time was spent on those interminable soap-opera things, or on sports events, or on horrible cacophonous music. The dramatic programs he couldn't figure out and the music he couldn't stand at all, but the sports kept him interested for a while. He tried to deduce the rules of the games—the one, for instance, in which two teams of eighteen or twenty Petty-Primes confronted each other in an arena. Each of the players carried a little live reptile the size of a shrew, and when they released them the creatures streaked for the opposite team, which did its best to stomp them into mush. That much was clear, but how the game was scored, or who won, Giyt could not tell. Or the other kind of contest in which two Petty-Primes engaged in bare-fist combat—but had their work cut out for them if they wanted to do each other any real harm, because they were tied to each other, back to back. Or the one—

Well, they were all pretty weird, but then, Giyt thought, probably the Petty-Primes would feel the same way about, for instance, ice hockey or sumo wrestling. What the Petty-Prime sports events did for Giyt was to give him a feeling for the funny little creatures as real people, with all their own habits and faults and relationships and interests.

That was where the new varieties of daydreams started. Giyt wondered if the Petty-Primes had their own history of wars and invasions and conquests. And then he began to think of how you might go about conquering the world of the Petty-Primes.

Thinking of it purely as an intellectual enterprise, it didn't seem that it would be all that hard to do. There didn't appear to be any large military forces among the Petty-Primes, though, to be sure, a sports arena was not the most probable place to look for them. But even if they had combat-ready troops and an arsenal, surely Earth weaponry could take them out in a fair fight.

He considered how you could go about getting Earth forces to a place where that fair fight could happen. The first thing to do, he decided, was to transmit some heavy-duty mass killer weapon through the terminal to wipe out all the Petty-Primes nearby, then a couple divisions of fast-moving

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armor to establish a beachhead. What sort of weapons for that first blow? That took some thought. Maybe chemical, maybe biological; you didn't want to use anything nuclear because that would wreck the terminal, too. The best thing of all would be to find something that would kill Petty-Primes but not Earth humans. For that you would need to know a lot about Petty-Prime biochemistry.

It took only a moment to check that out, and he was pleasantly surprised to find that there was, in fact, a considerable store of such data already in the banks.

Of course, before you could get that sort of operation off the ground you would have to secure your staging base on Tupelo itself. That would involve neutralizing all the other races on the planet, but that should be pretty straightforward: arrest the leaders, evacuate the area around the EPR terminal, bring in the weapons from Earth and the assault troops to follow—

But Tupelo's eetie leaders would probably resist, and that would mean killing. Not just killing creatures on another planet a zillion kilometers away, but murdering actual neighbors. Nonhuman neighbors, sure. Even theoretically, even in this mind game, did he actually want to kill, say, Mrs. Brownbenttalon and her husband?

It occurred to him that the commanders of some expeditionary force from Earth, assuming anyone on Earth were crazy enough to want to try anything like that, would have no such compunctions: eetie freaks would be just eetie freaks to them. (But that, of course, wasn't going to happen; it was precisely to prevent any such lunatic effort that all six races had to be present to allow transmissions to come in.)

Then it occurred to him that one of those eetie freak races might, just possibly, be crazy enough to want to try to invade Earth in the same way; and then he understood why there had been all those soldiers with their machine-guns that had been around the EPR terminal on Earth when he and Rina had come through it to get here.

That made Giyt thoughtful in a different way. It seemed that somebody had been thinking about the prospects of invasions before him. Not just as a daydream, either, but as a real-world possibility.

That was not an enjoyable thought. The human race on Earth had pretty much got over its addiction to wars. Was the cycle going to start again in space? Maybe right here on Tupelo?

Not a chance. That was ridiculous. There were no signs of that sort of pre-battle tension, and even if there were there just weren't any weapons on the planet to carry out such a scheme.

That was when he heard the rat-a-tat-tat-*boom* from outside.

That startled him, and it almost felt for a moment as though it was those machine-guns firing. It wasn't, though; he realized that at once. It was only the dumb thing the Kalkaboos did with their firecrackers every morning to greet the dawn, but it told him that sunrise had come. His private time was over. Any minute now Rina would be coming in to find out if

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he wanted pancakes or cereal for breakfast. And he hadn't made a dent in his real work.

He sighed and went back to the dreary business of trying to understand the Commission reports. Briefly he wondered if he had made a serious mistake in trading his idyllic life in Bal Harbor for the irksome constraints of this new existence on Tupelo. He couldn't honestly say that he had any good reason to be happier here.

The funny thing was that he actually was happier. Not for himself. For Rina. There was no doubt that the woman was blossoming by the hour here on Tupelo; and how strange it was, Giyt thought wonderingly, that he found himself happy simply because she was.

VII

There is only one inhabited island on the planet Tupelo. It occupies the center position in a thousand-kilometer long island arc, like Maui in Earth's Hawaiian chain. Like the Hawaiis, the chain on Tupelo was formed as a chunk of ocean crust dragged itself over a deep hot spot, producing volcanoes which ultimately produced islands; like the Hawaiian chain, too, this one is situated close to the planet's equator in the middle of an enormous sea—Tupelo's even vaster than Earth's Pacific Ocean. The island's soil is fertile. There is plentiful water arising from springs and streams on the central mountainous massif. However, as all the islands are of volcanic origin, they are singularly poor in exploitable mineral ores and completely lacking in fossil fuels. There are three other similar island chains elsewhere in the ocean; they also are mineral-poor. The only rich ore finds are on the planet's one Australia-sized continent, which lies near the planet's north pole.

Extraction of useful ores from the continental deposits, including petroleum, was begun by the non-human races before Earth was admitted to the planet. Most of the ores are worked and refined on site. Then the raw materials are fabricated into goods of all kinds by largely automatic factories.

—Britannica on-line: "Tupelo"

While Evesham Giyt was dressing after his post-siesta shower he turned on Silva Cristl's early-afternoon news broadcast. There wasn't much news that day, only a couple of announcements. The polar rocket was due in at 1950 hours, one family had given up on Tupelo and was heading back to Earth, the Bassingwells had had another baby, their fifth. Giyt listened with a feeling of comfortable lassitude. He and Rina had fallen into the pleasant custom of making love twice a day—at least twice a day; once at bedtime, but also once at the time of the midday siesta, because, Rina said, "what else is a siesta for?" It certainly made the afternoons nicer. When Rina looked in to announce that she was taking the younger de Mir children to the beach, because Lupe had to go in for a checkup, Giyt surprised himself by volunteering to walk along.

The day was warm and the beach was crowded, not only by Earth hu-

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mans. A pair of Kalkaboos, as near naked as made no difference, lay soaking up as much sunlight as they could extract from Tupelo's inadequate star. Even the Responsible One of the Petty-Primes was there. He wasn't alone, either. Rina was greeting two of his mates, and at least half a dozen of their little kits were running energetically around and kicking sand in each other's faces. When Rina greeted the little creature he responded at once, the translator phone in Giyt's ear doing its job as well, and as poorly, as ever. "A misfortune that cannot remain," the Responsible One apologized, throwing his head back to face the giant Earth-human. "Second eldest daughter just presently returning from first-ever duty tour at polar complex, must go meet rocket to greet." He waved one tiny arm in the general direction of the landing strip across the lake, and Giyt nodded.

"Yes," he said, awkward with the problem of talking to someone who only came up to his thighs. Giyt wondered if he should kneel, but the Petty-Prime didn't seem to mind. "I'd like to see that myself."

"Can be nothing more simple, you come with ourselves," the Petty-Prime declared hospitably. "Plenty of room on skimmer for even large person."

And Rina looked up from trying to rub sunscreen on the back of one of the squirming de Mir toddlers. "Yes, Shammy, why don't you do it? You've been stuck in the house too much. Get out and blow some of the stink off."

Giyt had never been in a skimmer before. Even on Earth he had rarely trusted himself in any kind of water-borne craft, and he wondered if he would get seasick in the fast drive across the lake. But the water was calm, the spray cast up by the skimmer's racing progress pleasing enough on a warm day, and it was a nice change from sitting before his screen. The Responsible One chattered away, pointing out the things of interest along the far lakefront: the crude road that led through the jungle down to the cargo-submarine port, the ancient dam, originally built by the Slugs for hydroelectric power back in the days when only the first two races had come to live on Tupelo—"Entire lake," he piped up, "is due to existence of dam Slugs built, was not here before."

Then they were approaching the rocket's landing pad. There were three or four other skimmers moored to its floating dock, a variety of races sitting in the craft and talking idly among themselves. He was surprised to see that Hoak Hagbarth was among them, which triggered a reminder in his brain: where was the energy-conservation plan Hagbarth had promised to give him for the Kalkaboos?

It was a good chance to remind him, but apparently the chance for that was not going to happen right away. "Must not debark out of skimmer craft yet," the Responsible One cautioned, as his children scurried about, tying the skimmer to the dock with cords the thickness of packing twine. "Not given permission. Requirement to wait for rocket to land, thus minimizing risk."

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In fact, Giyt could see the suborbiter coming at them, high up to the north. It was no more than a glint of metal and a flickering flare of red flame and white as its thermal shield ablated. They had left their arrival to the last minute; as Giyt watched the craft was visibly settling lower and growing larger. It passed directly over the island, no more than a couple of thousand meters up. Then it reversed course and, dropping rapidly now, touched ground, the flames from its main rockets almost blinding Giyt. When it stopped it was directly in front of the waiting group at the dock.

Chittering wildly, the Petty-Prime kits started to romp toward the rocket, only their parents driving them back. A low-slung vehicle Giyt hadn't noticed before began to roll in the same direction, one end of it tilting upward as it moved to form a flight of steps. Almost at once the rocket's doors began to open—first the heat shield, far too hot to be touched, then the inner door. The passengers began to disembark, stepping carefully over the hot metal of the exterior shield.

Then the Petty-Prime kits broke loose. First off the polar rocket was a pair of Petty-Prime females, one of whom hopped agilely down the steps to throw herself into the arms of the Responsible One. Cheeping and squealing, the kits were doing their best to swarm over them both—not cautiously. A Delt was coming down the steps in a hurry. He tried to dodge around the Petty-Prime family and didn't quite miss them all. One of the kits wound up under the Delt's foot; it squealed shrilly and began to whimper.

The situation quickly developed the makings of a nice little squabble, the Responsible One chirping belligerently up at the unrepentant Delt, others gathering around to take sides. Giyt observed that the infant wasn't really hurt; in fact it and all its siblings had already taken themselves away from this argument of the grown-ups.

But Hoak Hagbarth wasn't in the group.

It took Giyt a moment to find the man, off under the lee of the rocket, taking something in a woven-fabric satchel from a man who had just disembarked. They didn't linger over it. Hagbarth said a few words, the man nodded and turned away to head toward another skimmer, drawn up on the beach, while Hagbarth returned to his own.

Giyt caught up to him just as Hagbarth was putting the satchel into the skimmer's locket and taking a beer out. He looked up as Giyt approached along the dock. "Evesham," he sighed. "How're you today? Care for a beer?"

Giyt took it for the sake of avoiding a discussion. "How're we coming with that energy-conservation thing for the Kalkaboos?"

Hagbarth showed no sign of remembering what he was talking about, so Giyt patiently went through the whole thing again. Hagbarth listened with only minimal attention, which was annoying. But then the man was always annoying. Giyt controlled his temper. Hagbarth wasn't the first person in authority Giyt had had to get along with—briefly, at least; in his infrequent spells as an employee of some large

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concern. Experience had taught him patience; even when you knew that to almost any question there would be only two probable responses—either, "Don't worry about it," or the other, "Forget it."

This time Hagbarth expanded slightly on the stock reply. "Don't worry about it," he said. "I'll flange something up. Anyway, when you get to the next Commission meeting you can tell the Kalks there's a high-powered expert coming from Earth to look into the problem."

"Really? What's he going to do?"

"He's a she, and what she's going to do is study the problem, what did you think? Listen, Evesham, you worry too much. Just take it easy. Have another beer."

Giyt, who hadn't touched the first one, repressed a sigh. "Thanks, no." He looked around at the Petty-Prime Responsible One, still engaged in unfriendly conversation with the Delt who had stepped on his child; evidently he would have to wait for his ride back. To make conversation, he offered: "This is the first time I've been here. Do you always come down to meet the rocket?"

Hagbarth looked at him with a cautious expression. "Not always."

"Just to pick up that package this time, I guess?"

He meant nothing by it, but Hagbarth seemed to consider it a significant question. "Oh, that. Well, sure. Sometimes there's a shipment coming down from the Pole that has to be met, that's all. You know how it is. Most of the stuff comes by cargo sub, but there are some goods people are more in a hurry for than others." He sighed and stretched, then looked over Giyt's shoulder. "I promised to give the damn Delt a ride, but I didn't say I'd wait all day," he complained, then began to grin. "Look at those silly little Petty-Prime buggers; they're nuts, you know that?"

Giyt turned around to look. The Responsible One was still arguing with the Delt, but his kits were playing their childhood games. One pair had turned itself into an animated wheel—each kit holding the ankles of the other, and rolling across the mossy ground. Another pair was standing back to back, trying to flail their arms around to strike each other. "I've seen grownup Petty-Primes doing that one," Giyt announced. "It seems to be a big sport on the home planet."

Hagbarth gave him a questioning frown. "How do you know what they do on the home planet?" So, of course, Giyt had to tell him how, just for the fun of it, he'd gone to the trouble of figuring out the Petty-Prime protocols so he could listen in on their transmissions.

That seemed to impress Hagbarth. He said, "Huh." Then he reached into the cooler and pulled out two more beers. He popped them both open and handed one to Giyt, without asking whether he wanted it or not.

"You know," he said, "I forgot how good you were at that stuff." Giyt shrugged modestly, but Hagbarth persisted. "I wonder if you could do something important for me."

Giyt got cautious. "What's that?"

"Well, you know how we handle transmissions at the portal? There's

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six of us, and each one has a switch; if we turn it off the transmission fails. Only that's a pretty dangerous situation, you know? What I'd like, if you could do it, is figure out how I can cut the other guys out of the circuit."

Startled, "What the hell for?"

"So as to prevent accidents," Hagbarth explained. "This whole six-switch business doesn't make any sense. They just have it because they're scared, but what could happen? Who would try to sneak anything really bad through the terminal, for God's sake?"

Giyt said cautiously, "Well, you can't blame them for not taking any chances—"

"Sure, but, the way it works out, this 'safety' thing might actually *cause* an accident, don't you see? Something could go wrong. Hell, something did, once."

He stopped there, but Giyt's curiosity was piqued. He persisted. "What did?"

"It was a while ago," Hagbarth said moodily. "One of the keyholders turned off his key in the middle of a transmission. A bunch of Slugs were coming in and—well, they got lost. You know what happens to somebody like that? They were transmitted. They weren't received. So they're gone forever."

"You mean they're *dead?*"

"I mean they're *at least* dead. Maybe something a lot worse. Like something I don't even want to think about. Now, we don't want that happening to the energy guy from Earth, do we? Not to mention there's a six-planet meeting coming along."

"Six-planet meeting?"

"Oh, didn't you know? Twice a year all six of the races get together here on Tupelo to talk things over—it's like your Commission, you know? Only these people represent their whole home planet. Now, we wouldn't want anything going wrong with them, would we? We're talking about some of the most important people there are. So if you could manage to dig out those codes for me—"

Giyt thought it over for a moment, then temporized. "I thought you'd have all that stuff. I mean, you must have access to the portal design—"

"Must we? We don't," Hagbarth said bitterly. "The goddam eeties won't tell us how the portal works, and if we try to take it apart to find out for ourselves it'll blow up. I mean, a *big* blowup. They've probably got the thing booby-trapped with nukes or something."

"I don't understand," Giyt said plaintively. "Wasn't it this man Sommermen who invented the portal, based on what they call this Einstein-Podolsky-Rosen thing? Aren't all those guys human beings?"

Hagbarth shrugged. "I'm just telling you the way it is. So what do you say? Can you figure out those codes for me?"

"Maybe, but you've got me confused. I don't understand what you're telling me about the portal."

"Oh, hell," Hagbarth snarled, losing patience, "what're you asking me about all this stuff for? Maybe I misunderstood—and look, those Petty-Primes look like they're getting ready to go. Don't miss your ride."

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* * *

Giyt got away without promising anything, but he didn't stop thinking about the portal codes—and, most of all, about the portal itself. After dinner he sat down to stare at his terminal.

For starters, he was pretty sure he wasn't going to work a system for bypassing the other controls for Hoak Hagbarth—not, anyway, until he convinced himself that Hagbarth was smart enough and responsible enough to be trusted with that kind of power. But what about the bigger question Hagbarth had planted in his mind? Was there something that no one was being told about the portals' provenance?

It occurred to him that a good place to look might be in some of the other species' datastores. Anyway, it might be worth a little time spent at the terminal to see if he could find them.

He started with the Petty-Primes, and an hour's hard work later he had to admit he had drawn a blank. However unreliable the damn translation programs were, Giyt was pretty sure he'd converted every possible name for the terminals into the dots and strokes of the Petty-Prime script and all he'd had for his pains was a lot of garbage about the numbers of immigrants and the volume of goods shipped back and forth.

It had seemed like a possible shortcut, but it wasn't working. Giyt sighed and went back to the human datafiles.

But even the Library of Congress store was less than illuminating. Yes, somehow or other, Huntsville Inc. had pried a grant from some foundation or other to finance the airy-fairy project of interstellar exploration. Yes, they'd launched a dozen or so miniature ion rockets, one to each of the most promising nearby stars. . . .

But then what? How did they get from the tiny, slow, unmanned probes to the instant transportation of the Sommermen portal?

That was where the story clouded over. Dr. Fitzhugh Sommermen worked for Huntsville, that was definite. He had been conducting researches on the Einstein-Podolsky-Rosen simultaneity effect—and doing it very expensively, in Low Earth Orbit, paid for by another of Huntsville's free-flowing grants. The reason for that, the report said, was that it was necessary to avoid interference from Earth's surface gravity. Then somehow—that was when it all got misty and uncertain—he had come back from one session in orbit with the prototype of his portal device in his lander.

The rest of the story, for security reasons, was classified secret. But what "security reasons"? Military? But military security implied an enemy, and what enemy was involved here?

The questions were not getting answered, they were proliferating.

The obvious next place to look was in the Tupelo files of the Expanded Earth Society, but when Giyt accessed them he was no farther along. Maybe there was something there, but every interesting file turned out to be secured. A password was needed.

That was neither a surprise nor a problem; not for Evesham Giyt, who had a hundred ways of getting past such obstacles. The first was to check every terminal on the island that might have access to the protected sys-

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tem to see if someone might have been stupid enough to leave his password in its default setting—its extension number, his name, something like that. He wasn't surprised when that didn't work; even Wili Tschopp wasn't quite that dumb. Another way of gaining entry was to select a terminal that was privy to the closed file and flood it with extraneous messages. That was how Giyt had financed his college education, going through the university president's terminal to enter the financial files; they would normally have questioned his status, but with the president's terminal bogged down it could not give the reply that would have denied Giyt access.

On Earth that no longer worked; net users had become a good deal more sophisticated since Giyt's college days. But here on Tupelo—

It took less than five minutes for Giyt to get into the closed files. But when he was there he was still nowhere.

The trouble was that even the secured files were still unreadable for him. He found plenty of entries that concerned the "portal" or the "Sommermen terminal" or any of the other variations he could think of on the term, but, just as with the Petty-Primes, they dealt only with what particular shipments had arrived or departed on particular days. And even those were enciphered.

What did it mean, for instance, when an entry said: "Present TARBABY stocks: 1533 JUNIORS, 114 GRABBAGS, 11 SUPERS"? Or "Need 16 gross additional HAIRNETS"? Not to mention the wholly incomprehensible transmissions like "GREEKS 53 FLYSWATTERS, COPTS 2600-plus RUTABAGAS all sizes, others not identified."

Giyt blanked the screen and sat back. He could, of course, ask Hagbarth what all this stuff meant, but that would mean telling Hagbarth he'd snooped into the files . . . and, anyway, the mere fact that it was all encoded meant that it probably was something Hagbarth wouldn't want to talk about.

Giyt hated to admit defeat, even when only curiosity was involved. He knew that if he were on Earth he could probably get into the master system there. But he wasn't. Here on Tupelo there was no continuous contact with Earth, only the burst transmissions that went to and from Earth when the EPR portal was open. He had no firsthand knowledge of that stuff, since neither he nor Rina, of course, had any reason to communicate with anyone back on Earth.

But, as it turned out, about that he was wrong.

VIII

The climate of the planet Tupelo is uncomplicated, if sometimes drastic. There are relatively few major hurricanes, perhaps because of the lack of large land masses, which means relatively few collisions between dry, continental, high-pressure air masses and humid maritime lows. However, disturbances from the planet's intertropical convergence zone may from time to time drift north or south and propagate some severe storms. Generally speaking, Tupelo's one inhabited island, which lies quite

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close to the planet's equator, avoids hurricanes because there is relatively little Coriolis force at those latitudes. There are, however, exceptions.

—Britannica on-line: "Tupelo"

Giyt discovered that his wife had been communicating with Earth when she asked him for a favor. "Shammy, hon, I have to go to the store. I'd appreciate it if you'd come along."

That was a little surprising, because Rina knew that her husband wasn't fond of shopping, but then she went on. "It's a nice day for a walk," she wheedled. "Anyway, I need you to help me pick out a birthday present for my sister's husband."

Then he was really astonished, since he hadn't known she had a sister. Rina was curiously defensive about it, too. "Oh, yes," she said, "she's living in Des Moines. So I dropped her a line, just to let her know where I was and what I was doing."

"You sent a message to Des Moines?"

"Well, sure, Shammy. She's the only sister I've got. Wasn't that all right?"

Giyt wasn't quite sure of the answer to that. It had been his belief that they had cut their ties with Earth entirely—that is, not counting his private stashes of mad money, available any time he chose to draw on them. "Anyway," she went on, "there was an answer from her in the last transmission—wait a minute. I'll show you."

She poked at her terminal, and in a moment her sister's face appeared. The woman on the screen didn't look a lot like Rina, Giyt thought: older, sterner, sharper-featured. But she was smiling as she said, "Well, Rina, you could have knocked me dead. Imagine you settled down at last! And married to an important man, at that—a mayor, for heaven's sake!"

Rina stopped it there. "The rest is just personal stuff," she said, sounding embarrassed. "We had a lot to catch up on because, you know, she didn't much care for my, uh, lifestyle. So we sort of lost touch for a while. Anyway, her husband's birthday's coming up. I'd like to get him something. The trouble is I don't know him well enough to know what he'd like, so if you wouldn't mind—?"

Giyt didn't mind. He did have a pretty full afternoon ahead of him—the Commission meeting first, and after that there was a scheduled transmission from Earth, but with live people coming in this time so that he would have to go to the terminal to greet them. No problem there, though. Giyt had become very relaxed about the Commission meetings, now that he'd actually read up on the reports ahead of time. And even better, he had a tangible announcement to offer the Kalkaboos.

The store wasn't crowded. There was a knot of people in the food section, picking over the fresh vegetables and the wrapped cuts of meat, with another handful sorting through the video displays for things to order from Earth. None of that was what Rina was after. "I'd like to get him something from Tupelo if I can," she said, doubtfully fingering the sleeve of an anorak. "How cold do you suppose it gets in Des Moines?"

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"Cold enough," Giyt told her, looking under the collar of the coat. He was a little surprised to see cold-weather gear in this balmy place, but no doubt it was for anyone unlucky enough to have to work in the polar factories. Then he found the label. "I think that one comes from Earth, though."

She sighed. "I know, but the ones they make here are all plastic." As they were. As were most of the locally produced garments, because there were these oil wells at the Pole, and there was no need for the oil as fuel. The nuclear plant on Energy Island took care of all the town's energy needs, so most of the oil not burned at the pole itself got turned into plastic and fabricated in the polar factories into—well, face it, Giyt thought, mostly into junk.

The biggest export item on display was the doll collection. The dolls came in six varieties, one for each race on Tupelo, and they all squeaked out a friendly line of patter from their interior chiplets—"Hi! I'm a Slug! I like wet places and I can sing!" But Rina's brother-in-law, a forty-year-old insurance broker in Des Moines, Iowa, was not likely to want a doll of any kind. Nor did any of the locally made kitchen appliances seem like a good bet, however smart they were with chiplets of their own. Rina finally settled on a mantle clock. It was a fairly nice-looking thing, and it had two faces side by side, one displaying each hemisphere of the planet—not that there was much difference between them, unless you knew what island groups to look for. One face told Tupelovian time, the other displayed the 24-hour Earth clock. "I guess it could be a kind of conversation piece," Rina said doubtfully, hefting the thing in her hand.

"You bet," Giyt encouraged. "Anyway, he sure couldn't get one of those in Des Moines. Let's get them to ship it."

Giyt enjoyed walking around the town when he had the time for it. He liked seeing the new buildings going up—Delts installing the electrical connections, Slug crews running the machines that dug trenches for the sewer and water pipes. There was a human bakery cheek-by-jowl with a Kalkaboo brewery. He passed the human ecumenical church, reminding him that, since he was the mayor, after all, probably he and Rina ought to go there once in a while, and a Centaurian home with the little males bossing children around.

But the day was no longer fine. It had clouded over while he was in the store with Rina, and he wasn't halfway to the Hexagon when he heard thunder. The storm came on fast, and it was a big one; thunder crashed like artillery fire and startling displays of lightning flashed through the clouds. The rain had already begun and he was drenched by the time he got a car. He got drenched again when it let him out at the Hexagon. So as the meeting of the Joint Governance Commission started he was soggy and he no longer had the feeling of being entirely comfortable about it.

He was right about that, too. The meeting was a mess. The Petty-Primes'

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Responsible One was in the chair, and he appeared to be having a private feud with the Principal Slug. The meeting got off to a late start because the Principal Slug and the Petty-Prime were off in a corner squeaking and slobbering furiously at each other; and then, when finally the Responsible One climbed into his doll-sized chair and declared the meeting in order, Mrs. Brownbenttalon seized the floor to complain about the delay. "Have wasted expensively irreplaceable time of important and very busy persons here most shockingly," she declared—or so the translation button in Giyt's ear made her say. "Personally possess great forbearance or would propose immediate motion of censuring!"

It went on like that. The Delt General Manager complained that the Slugs had damaged some of the electrical connections in digging sewers for the new houses; the Principal Slug announced the Delts were unreasonable, almost as bad as the Petty-Primes; the Petty-Prime in the chair declared the Principal Slug out of order. They were all at each other's throats—even the Centaurian, Mrs. Brownbenttalon, whom Giyt had regarded as the most sensible of his colleagues on the Commission. He could not imagine why. Even the audience, surprisingly numerous this day, seemed restive, chattering among themselves. He caught a glimpse of Olse Hagbarth sitting with her arms folded over her chest, looking amused and unsurprised; she winked at him, as though at a shared joke. But Giyt didn't know what the joke was. So he sat there, listening in wonder, until the Kalkaboo High Champion got his chance to say that the proposals of the other races for reducing their wasteful use of power were totally unacceptable. Then Giyt managed to get in his announcement that the Earth humans had an expert coming to study the whole question of the powerplant, the Petty-Prime declared the meeting adjourned and everyone flocked for the door.

By the time Giyt got to the exit the rain had slackened off to a steady drizzle and most of the waiting carts were already taken. Olse Hagbarth was waiting for another in the shelter of the doorway and she grinned at him. "Real catfight today, wasn't it?"

"What was it all about?" he asked.

"Oh, didn't you know? It's the six-planet meeting coming up. They're all antsy because they want to look good for the VIPs from home—ah, here's my cart," she finished, as one last vehicle rolled up to the curb.

She was heading for it before Giyt could react. He hastened after her. "Look, Olse," he said, "I need to get to the terminal."

"Of course you do," she said sunnily, one hand on the cart door. "Have a nice time."

"Well—what I mean is, any chance you could give me a lift?"

She looked surprised. "I wish I could help you out, Evesham, but I'm going the other way; I've got the new housing to see to, you know. Anyway, it isn't that far to walk, is it? And, look, it's hardly raining at all any more."

Actually the rain had almost stopped by the time Giyt got to the Sommermen terminal and so he was

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only mildly soaked this time.

What surprised Giyt was to see how many people, and non-people, had gathered at the terminal, most of them sitting warm and dry in the cars that had brought them. (Which explained how so few cars had been available at the Hexagon.) He caught sight of Hagbarth and Wili Tschopp standing by Hagbarth's portal control, but before he could go there squeals from one of the carts attracted his attention. He turned to see the Divinely Elected Savior of the Centaurians, Mrs. Brownbenttalon, poking her long nose out toward him. The translator in his ear piped, "Apologetics, Mayor Large Male Giyt. Should have to offered the sharing of transportation from Hexagon. Trust you scurried well through raindrops."

"Thanks. Actually I was glad for the exercise," he lied.

It seemed to Giyt that Mrs. Brownbenttalon was giving him a skeptical look—as much as a curly-haired anteater could manage a look of that kind—but Wili Tschopp was shouting at them to stand back. The golden glow was beginning to surround the terminal. Almost at once it began to flash blue and white.

The transmission from Earth was arriving. No, had arrived; the portal lights went out as the sharp puff of displaced air startled Giyt. He blinked, and when he opened his eyes again fifteen or twenty large crates were stacked in the bay. A woman was sitting on the edge of one of them, tapping her feet and frowning impatiently, and behind her were three other rather worried-looking adults and a small child, all of them holding suitcases, purses, and each other's hands.

It was time for Giyt to carry out his mayoral duties. He advanced on the newcomers, hand outstretched. "Welcome to Tupelo," he said. "I'm your mayor, Evesham Giyt, and this gentleman over here—" waving toward Hagbarth, hurrying in their general direction "—is your Ex-Earth representative, Hoak Hagbarth. Hoak will arrange for your housing, and all your other needs, so if you'll excuse me—"

Hagbarth gave him a scorching look. "Stay here, Giyt," he ordered. "Keep these people company while I take care of Emissary Patroosh."

"How?" Giyt asked, but Hagbarth was already, most obsequiously, greeting the woman on the box.

So Giyt found himself doing the tour-guide thing for the new arrivals, while out of the corner of his eye he saw all the non-humans getting out of their carts and swarming over the cargo. Mr. Brownbenttalon had leaped off his mate's back and was running the fabric of some new garments through his tiny paws; four or five of the Petty-Primes were concentrating on the luggage belonging to the immigrants. One of them sniffed at a bunch of grapes suspiciously, then bit one of them in half, stared at the interior and then spit the thing out. The woman Giyt was talking to cried out, "My basket of fruit!" They all abandoned Giyt to protect their belongings, as Wili Tschopp came up behind him.

"When they've got their stuff," he said, "you can take them to Olse's house. She's sorting out places for them to live."

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"I never had to do that before," Giyt remarked suspiciously.

"No, of course not. Usually Hoak does it for you, but this time he's got the energy lady to take care of. And, listen—" smirking again, in the way Giyt had learned to hate "—you be sure to give my regards to that really good-looking lady of yours."

By the time Hoak Hagbarth had shepherded his VIP guest's luggage past the inspection—with much argument and raised voices over the scientific instruments she'd brought with her—he escorted her to the waiting cart, pausing to introduce her to Giyt. "Dr. Emilia Patroosh, Mayor Evesham Giyt. Listen, Giyt, you'll have to take the new people to my place, so Olse can—"

"I know," Giyt said, politely shaking the hand of the energy expert.

"Fine." Hagbarth started to get into the cart with his VIP visitor, then paused. "Hey, listen. I've got an idea. You were wondering about the power situation? Why don't you go along with Dr. Patroosh to take a look at Energy Island tomorrow? I'll have a chopper ready for you in the morning. Take your wife; it'll give the two of you a chance to see the sharks."

"Sharks?" But Hagbarth only shook his head, grinning, as the cart sped away.

IX

The geological and paleontological history of the planet Tupelo is not well understood, due to the paucity of land areas available for digging. No fossils have ever been discovered. However, it is generally believed that sometime in the relatively recent past, perhaps circa 2 to 4 million years BP, the planet underwent an extinction event similar to the ones which, on Earth ended the Cretaceous and other ages. The causative event—whether a bolide impact, an episode of very large-scale vulcanism or something unique to Tupelo—is not known. However, the result is clear. Whatever large land animals existed on Tupelo disappeared at that time. Life in the ocean, however, is quite another matter.

—Britannica on-line: "Tupelo"

It was a sparkly dawn day, with dew beaded on the "grass," the sun still hidden behind the great mountains to the east, the air cool but comfortable. Altogether it was just the right kind of day for a chopper trip to Energy Island . . . except that there was no chopper. Hoak Hagbarth apologized profusely to the VIP woman from Earth. The gyrocopter, unfortunately, was in the shop. So, if Dr. Patroosh didn't mind, they would have to take a Delt skimmer to the island. Either Dr. Patroosh didn't really mind or she was being a good sport about it, "Let's just do it, all right?" she said.

When they reached the lake shore the Delt skimmer turned out to be a much larger ground-effect vehicle than the one that had taken Giyt to see the polar rocket land. Giyt's first look at it made his eyes pop. Startlingly, the thing was gleaming in metallic gold and ten or twelve meters long. It came complete with a Delt pilot who was sitting on the rail, impatiently tapping his long fingers on his knee.

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When Rina politely thanked him for agreeing to transport them the Delt turned one wandering eye on her, the other wavering between Giyt and Dr. Patroosh, and gargled something that the translator turned into, "Imposition no greater than expected, happening at all times without considerateness. Board now. Sit. Strap in for bumps."

There weren't any bumps, though, at least not at first. The skimmer lifted on its air cushion and slid out onto the surface of the lake, heading swiftly for the hills at the far side. Giyt was glad for the moving air, which diluted that Delt aroma from the driver. Rina didn't seem to mind the smell. She was squeezing Giyt's hand in excitement, staring around at everything—back at the low buildings of the town, at the approaching hills, at the barely visible rim of the old Slug dam that, long ago, had created Crystal Lake for their own first colonists, at the fittings of the Delt skimmer. Those were pure non-human technology, all right: corrugated seats that pressed cruelly into human buttocks, double viewscreens for the pilot—one for each eye?—and an instrument panel that kept whispering and beeping constantly. Even the safety straps were woven of some kind of glasslike fiber, and where they rubbed against the bare skin of Giyt's throat they scratched.

Then they were across the lake, the skimmer gliding easily onto the shore and entering the rude roadway through the woods Giyt had seen on his previous trip. There was plenty to stare at there.

Ground-effect vehicles worked splendidly on flat surfaces, but they did poorly on grades. In order to ease the slope on the far side of the dam the skimmer roadway was a series of switchbacks, and, yes, now there were plenty of the bumps the pilot had warned against. There was no real road there at all, just a bulldozed track littered with knocked-down logs. Every time the skimmer crossed one the jolt relayed itself to the bruisable bottoms of the human passengers.

But it was a small price to pay. These were not the woods Giyt had seen on the slopes of the mountain. There were flickers of color darting about among the trees—barely glimpsed before the skimmer had left them behind—birds? insects? The trees themselves were not of any variety Giyt had ever seen before. Some were almost branchless until they expanded into an umbrella of fronds at the top, almost turning the roadway into a tunnel as they met overhead. Some hardly looked like trees at all—looked like the stumps of even huger trees, four or five meters thick, no more than half a dozen meters tall. When Rina exclaimed over them the VIP woman looked up from the palmtop she had been intently studying and said, kindly enough, "That's how they grow. It's what you get when you don't have any large animals to knock them down; there are trees like that where my grandparents come from, on the Indian Ocean islands of Earth."

"That's right," Rina said sociably. "There aren't any large animals at all on Tupelo, are there?"

"Not on land," the woman said. "But if you want to see large animals, wait till we're crossing the strait."

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Then they reached the bottom of the slope. The skimmer left the roadway to slide onto the surface of the river below the dam. A pair of huge steel whales were moored at the side of the stream. Though Giyt had never seen one before he recognized them. They were the submersible cargo vessels that carried goods to and from the polar complex. The skimmer pilot, who had ignored his passengers as he concentrated on making the turns in the road, jerked a long thumb back upriver. "Place where Slugs live, under dam. They like wet." He thought for a moment, then added, "Slugs not so bad, though. Not like damn Petty-Primes, get all crazy when somebody comes near damn tiny young. Just the other day my ex-brother have much abuse from Responsible One—you know, you saw whole thing, right?"

"I guess I did," Giyt admitted.

"So you know. Totally without warranted crapola, right? Kit not hurt. Purely accidental stepping on, anyway. Sure, he only ex-brother, but still kind of family, you know? So must stick up for." He shook his head judgmentally, the eyes wandering in all directions. Then he added warningly, "Gets stinky now."

Giyt twisted his neck to peer behind them, but caught only a glimpse of igloo-shaped mud structures, far back. He was turning over in his mind the curious fact that a Delt would describe anything else as "stinky." Then the odor hit them. "Christ," he said, gasping.

Dr. Patroosh gave him a tolerant smile. "See that pipe?" she offered—it was a meter across, jutting out into the river, with an ooze of foul-looking sludge coming out of it. "Sewage. It comes from the town. Whatever you do, don't dabble your fingers in the water."

At least on the river the ride was smoother than on that terrible jungle trail. Slowly the appalling stench dwindled to bearable proportions—or else, Giyt thought, they were getting used to it. The stream broadened. The woods surrounding it diminished, and then disappeared. The skimmer left the channel that had been dredged out for the cargo subs and glided out onto a broad beach.

Rina gasped in alarm, and Giyt saw why. The great waves of Ocean were pounding in on the pebbly shore. Creatures were riding them, like surfers on a Hawaiian beach. Big creatures. *Nasty* ones, some that looked like the "sharks" that Hagbarth had mentioned, letting themselves be thrown up on the beach and floundering around on their pectoral fins for a while before lumbering back into the water; some like lizards, that dug in the pebbles with their long, sharp-toothed jaws—looking for something to eat?—and were careful to stay as far as possible from the sharks.

"It's the sewage that brings them," Dr. Patroosh said, without pleasure. "You always see them here."

And the pilot called, "You bet! Mean bastards. Eat you up, one bite, quick-quick. Get bad bellyache after, sure, but what you care? By then you dead. Now everybody shut up, must catch wave."

He had throttled back the skimmer's thrusters, though keeping the fans that

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raised them above the water level at full power. They idled for a moment in the shallows where the river broadened out to enter the sea; then he poured on the power, the skimmer leaped ahead, they slid over the froth deposited by one breaking wave and climbed the next before it crested. Then they were in deep water.

Nonchalantly the pilot stood up, swaying easily in the motion of the sea. From a compartment in the wall he took out a thing that looked more like a pocket camera than anything else and held it to one eye as he began to study the sea. Something in the control board began to hum and stutter; Giyt hoped it was an autopilot of some kind. At least, though the pilot was paying no attention at all to what the skimmer did, they seemed to be moving steadily toward a smudge on the horizon. Giyt supposed it was Energy Island.

As the skimmer rose and fell over the vast Ocean swells Rina began to look uncomfortable. The pilot took the thing away from one eye long enough to stare at her. "You think you going to puke? OK, over side, Ocean don't mind; only don't lean over too far, Christ's sake. Got no way to pull you out before, you know, gobble-gobble."

By the time they reached Energy Island—sliding right up into a dock as behind them a great steel-wire gate closed to keep the shore animals out—Dr. Patroosh had explained why she preferred the skimmer to the gyrocopter. Under its gold skin the skimmer was built of a sort of foam plastic, so light that if anything went wrong the vessel would simply float until rescue arrived. The chopper had its own flotation devices, but swells would overwhelm them quickly enough. Then it would sink like a rock, and, she said positively, nodding toward the hungry creatures on the far side of the gate, "You can see why you don't want to go swimming in Ocean."

Whoever built the powerplant seemed to like gold as much as the builder of the skimmer did. The plant was a collection of hemispherical golden domes. There was a twenty-meter-tall giant hemisphere in the middle and smaller ones, which gave off a sound of big engines running, nested around it. Every one of them was bright with a golden skin. The difference was that what the powerplant's skin covered wasn't foam plastic. It was something hard and solid. Concrete, maybe. Steel, more likely, Giyt thought.

The Delt pilot was watching him. He tapped Giyt on the shoulder with a long-fingered hand and said with pride, "Good electric, true? You know who build plant? Us. Not stinky Slug, Centaurian, Kalkaboo; when we come they have zero but damn pitiful hydroelectric dam for power. Delts laugh and laugh. Too tiny. Us build good one here. Fuse atoms, fine Delt designings. Then plenty electric, you bet, except now so many immigrants coming in need more. Oh," he added quickly, not meaning to give offense, "not just you Earth-creature guys, you understand? Damn Petty-Primes even worse."

Dr. Patroosh scowled at him. "Wait for us here," she ordered; and, to Giyt

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and Rina, "Come on." And a moment later, when they were out of earshot, "You know what they want? They want us to dig the damn *foundations* for the new plant, while they supply all the high-tech stuff that we don't even get to look at. Like we were some damn Third World country that doesn't know anything about technology." She shook her head gloomily. "Anyway," she said, "I've got to talk to the head controller—he'll be another damn Delt, of course. You two can look around. There ought to be a few Earth people on the shift; maybe you can get one of them to show you what's what."

Evesham Giyt had never been in a powerplant before. He had never thought much about one might be like, either. Electricity was what you got when you turned a switch. Here inside the belly of the plant it was something else, something that shook the walls with low-frequency rumbling and hurt the ears with high-pitched whines. And those, he knew, were only the sounds of the turbines that turned steam into electricity. The source of the infernal heat that distilled Ocean's water and then flashed it into steam to spin the turbines was silent. But it was there. Somewhere no more than a few dozen meters away, Giyt knew, incalculable numbers of hydrogen nuclei were madly coupling with each other to make helium. It was the same nuclear fusion that made the old H-bombs so terminally lethal—no, it was scarier than any H-bomb, because what was happening inside the biggest dome wasn't a single explosion. It was a process rather than an event, and it went on and on.

It did not seem to Giyt that this was a thing that should be left to run itself, however good the automatic controls. But there seemed to be nobody in sight. As he and Rina walked along the golden corridors they passed a sleeping Kalkaboo, curled against a wall—he woke up long enough to glare at them, then returned to sleep, It was only after ten minutes' search that they heard a whirring sound. It came from where a human shift worker was watching a porn film on his handset as he followed the cleaning machines around.

When Giyt asked the man for guidance he gave Giyt an injured look. "You don't recognize me, do you? Colly Detslider. I'm the relief driver on Pumper Three in the fire company."

But after Giyt apologized and shook his hand the man was happy enough for an excuse to leave the machines to do their job on their own. Yes, he told them, there was a full shift on duty, thirty persons, five of them human like himself. No, he didn't know where the others were. Sure, he'd show them around, although it was only fair to warn them that his own job here was janitorial and he didn't know much about the machinery.

He knew enough, though, to keep them from going near the central chamber where the tokamak held its fusing plasma in an unbreakable magnetic grip. They saw the pumps that sucked cool water in from Ocean, to make steam and then to condense it when spent; they saw the gratings that kept the creatures of Ocean from being sucked in along with it; they saw

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the remarkably slim cables, wrapped in the chilling jackets that made them superconducting, that carried the powerplant's output down under the strait to the community that used it. They even peeped into the control room, every wall a mosaic of screens and signals, where they saw Dr. Patroosh furiously arguing with a pair of uninterested Delt controllers. They would have seen more, probably, but Detslider was watching the time. He was due for his lunch break, he informed them, and they were welcome to come along if they wanted to.

Lunch was machine-served in a large room filled with tables, couches, and Kalkaboo tree-rests, sparsely occupied by beings who paid no attention to the human visitors. To Giyt's displeasure the lunch turned out to be creamed chipped beef on toast. "It's always something the machines can dispense. Real crap," Detslider told him. "Come on. Take your plate and we'll go someplace that smells better to eat it." A Delt, sipping some thick yellow liquid from a shallow bowl by the door, turned one eye to glare at Detslider as they left, but the man ignored him. Five meters down the corridor there was a smaller room, with two human women and a man playing pinochle at one table, and space for the visitors at another. While Giyt doggedly ate his lunch Rina made polite conversation with all of them. Detslider came from Pasadena, he said, but left it for Tupelo because there was too much crime in California. Like his job? Well, it was all right, but boring. The others, respectively from Tucson, Pottsville PA and Boston, agreed, the woman from Pottsville adding, "The damn Delts push you around here, like they owned the place." But it wasn't just the Earth humans that suffered, she conceded; the Delts acted superior to everybody.

When they went back to the control room Dr. Patroosh spied them, snapped some final argument at the Delt controllers, and swept past them at the door. Over her shoulder she called, "Come on, we'll go home. I'm not doing any good here." And crossing the strait in the skimmer she was silent and morose. When Rina asked her sociably how her mission had gone, Dr. Patroosh snapped, "Lousy. They've got this whole fusion section locked up, nobody but Delts allowed in—because of radiation danger, they say, but for Christ's sake we know all about radiation danger." She glanced at the Delt pilot, who seemed to be paying them no attention, but lowered her voice. "I'm going home to report. We'll see what happens . . . but I'll bet we'll cave in again and dig their damn foundation for them." Then she was silent. So were Giyt and Rina until their pilot, sweeping the surface of Ocean with his glass, cried out joyfully and began pulling something heavy and harsh-looking out of a locker. With one hand he steered the skimmer toward dimples of disturbed water, with the other he was locking the object from the locker to a mount on the skimmer's rail.

"Now what?" Dr. Patroosh demanded irritably.

Giyt had no answer for her, but Rina piped up. "Do you know what that looks like, Shammy? That long

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gold thing with the barbs on the head?" And then of course he did. It was a harpoon, and the Delt proved it a moment later by firing it at the little whirlpools—no, at something under the whirlpools, something red and many-eyed that gasped and snorted as the shaft struck home and it rose briefly to the surface.

The pilot shrieked in exultation, something that the translator did not even try to put into English. The creature sounded, pulling a hundred meters of supple, braided cable out of the harpoon's reel. The pilot made an adjustment on the reel, darted to the controls and started the skimmer at high speed toward the coast. Then he turned to his passengers, grinning. "Good eating, you bet! But maybe too far out for any good."

"Too far out for what good?" Rina asked, but the Delt had already turned away. He was talking rapidly on the communicator to someone ashore, keeping one eye on the skimmer's wake, where the cable was stretched out almost horizontally. At the end of it Giyt could see the quarry flailing about for a moment, then it disappeared below the surface. Ominous whirls appeared all around it, and then something else was in the water. Blood?

It was blood, all right.

By the time the skimmer reached the rivermouth a Delt vehicle built like an armored car was waiting for them, but it was too late. When the pilot hauled his catch in to retrieve his harpoon most of the creature was gone, slashed away by the horde of predators.

The pilot laughed and spoke into the communicator; the tanklike thing lumbered away as he turned the skimmer upstream toward the town. He said philosophically, "Too far out, you understand? Too bad. Wonderful to eat, only not just for Delts." Then he pursed his inverted lips, as though trying to remember something, then brightened. "Hey, I know Earth thing! You know Earth-human liar Kepigay?"

"Who?" Giyt asked, and the Delt tried the name several times more before Rina said: "Oh, do you mean Ernest Hemingway?"

"Yes, excellent liar, Kepigay. Greatly enjoy Earth human lies; Earth humans such excelling liars. You know Kepigay old Earth romance lie, *Man Approaching Death in Relationship to Ocean*?"

"I think he means *The Old Man and the Sea,*" Rina offered. "We had it in American lit in Wichita."

The pilot nodded enthusiastically. "Yes, I had volume also in aboriginal folk lie study. Damn good lie, that one. You see? Same thing here; catch fish too far, sharks eat. Aboriginals have much native lore which persons can learn from, I say always—though not," he added, with one eye wandering over to fix on Dr. Patroosh, "on subject nuclear fusion."

And all the way back to the town their pilot entertained them with stories of his fishing exploits, while Dr. Patroosh glowered silently into space. When the pilot let them out on the shore of Crystal Lake, he said cheerfully, "Survive well until dark."

Rina giggled. "I think he means have a nice day."

"Yes, exactly. Do not shoot brain

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fragments all over house like famous Earth-human liar Kepigay."

They dropped Dr. Patroosh off at the Hagbarth home. Then, in the car going to their own house, Rina said thoughtfully, "You know what's funny, hon?"

"What?"

"Well, Colly's from California, right? We're from Kansas. Matya comes from a little town on the Jersey shore, Lupe from just outside of Albuquerque, those other guys—"

"What's funny about that? Everybody has to come from someplace."

"Well, sure, Shammy, but they're all from *America*. Wouldn't you think there'd be some people from South America or Asia or somewhere?"

He thought for a moment, then brightened. "What about Dr. Patroosh? She said she was from some island in the Indian Ocean."

"No, not exactly. She said her grandparents were. She's an American, all right. So I just think it's funny that there isn't anybody from the rest of the world, that's all." ■

TO BE CONTINUED IN THE NEXT ISSUE.

We welcome your letters, which should be sent to *Analog,* 1270 Avenue of the Americas, New York, NY 10020. (CompuServe: 71154,662. Internet: 71154.662@compuserve.com.) Space and time make it impossible to print or answer all letters, but please include your mailing address even if you use e-mail. If you don't want your address printed, put it only in the heading of your letter; if you do want it printed, please put your address under your signature. We reserve the right to shorten and copy-edit letters. The e-mail address is for editorial correspondence *only*—please direct all subscription inquiries to: P. O. Box 54625, Boulder, Co 80322-4625.

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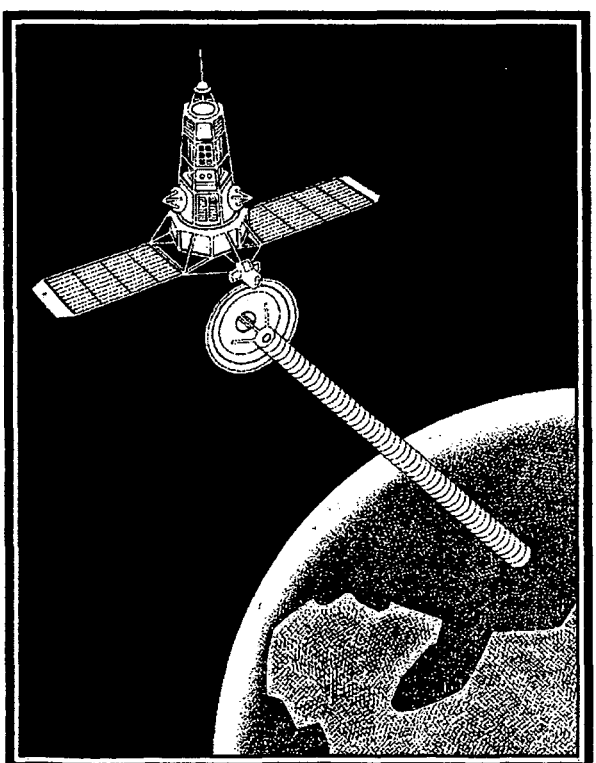
Ben Bova

LASER WEAPONS

Sometimes the story of how and why research develops is as interesting as the results.



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This is a true story about a group of very bright scientists who changed the world. It is a story of big science and global politics. Like most true stories, it has no real ending because it is still being played out now in laboratories and test ranges and—within a few years—on battlefields.

It is also a very personal story, because I played a role (a small role, to be sure) in its beginnings and stayed in close touch with its continued development over the past 30-some years. So, in a sense, this is a personal memoir, too.

The first laser was developed at the Hughes Research Laboratory in Malibu, in 1960. For several years lasers were more of a curiosity than anything else. Their power outputs were typically less than one watt, although by cramming that energy into very short pulses they could produce pulses of much higher power.

They were laboratory toys, fascinating for physicists but of limited practical use. By the mid-1960s the standard line about lasers was that they were a solution looking for a problem.

That first laser was made from an artificial ruby. Other solid, crystalline materials were soon used, then gaseous mixtures such as helium-neon were made to "lase."

In their search for higher laser powers, researchers turned to a mixture of carbon dioxide, nitrogen, and water vapor. Since the active ingredient in the mix was CO_2, they were called carbon dioxide lasers.

The world's most powerful laser, by 1964 or so, was a carbon dioxide laser that emitted an infrared beam of nearly three kilowatts. Built by Army scientists and engineers at Redstone Arsenal in Huntsville, Alabama, this "Long Tom" was basically a glass tube 53.4 meters long (178 feet). Its intense infrared beam could snap the blade of a steel knife almost instantly, but no one predicted that the Army would be carrying into battle glass tubes half the length of a football field.

The breakthrough into truly practical high-power lasers was made at the Avco Everett Research Laboratory, in Massachusetts, where I worked from 1959 until 1971 as a science writer and marketing manager.

AERL, as we abbreviated it, was a sort of Camelot for me, better than any university. For 12 years I worked with very bright, very dedicated scientists and engineers my own age. My job demanded that I learn what they were doing, and thus I acquired a broad (though not necessarily deep) understanding of aerophysics, plasma dynamics, and many other disciplines.

The researchers knew that I wrote science fiction and often kidded me about it. Yet here I was in the midst of an ongoing science fiction story, complete with characters, plots, and the highest technology on the planet!

It was great fun. The only thing that eventually dragged me away from AERL was that I was offered the job of editing *Analog* when John W. Campbell Jr. unexpectedly died. But that's another story.

AERL had been founded in 1955 by Dr. Arthur Kantrowitz, from Cornell University. At that time, US intelligence was startled to find that the Soviet

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Union was test-flying ballistic missiles over ranges of thousands of miles.

You see, at the end of World War II, both Washington and Moscow realized that an upscaled version of Germany's V-2 missile, combined with an atomic bomb, would make what was then called "the ultimate weapon." After all, there had been no defense possible against the V-2 rockets that blasted London. Imagine unstoppable longer-ranged missiles dropping nuclear bombs on cities halfway across the world.

The US Air Force commissioned a panel of distinguished scientists, headed by Vannevar Bush of MIT, to look into the possibilities of developing long-range ballistic missiles. Bush pooh-poohed the idea, because rockets were too small to lift the many tons that atomic bombs weighed. And not terribly accurate, either.

"In my opinion," said Bush to the Air Force, "such a thing is impossible for many years. I think we can leave that out of our thinking."

In Moscow, Russian scientists faced the same facts. But Josef Stalin told his Kremlin underlings that an intercontinental missile "could be an effective straitjacket for that noisy shopkeeper Truman. We must go ahead with it, comrades! The problem of the creation of transcontinental rockets is of extreme importance to us."

By the early 1950s, lo and behold, the Soviets were flying those "impossible" missiles over test ranges of several thousand miles. And nuclear weapons had come down in size and weight, as well, while going up in destructive power.

Washington instituted a top-secret crash program to catch up to the Soviet lead in this new form of weaponry. The very public "space race" of the 1960s was mainly a demonstration by both the USSR and the US that each side had long-range rockets.

But in 1955 there were three unsolved problems involved in building long-range ballistic missiles: propulsion, guidance, and re-entry. Rocket engines could be built and tested on the ground. Guidance systems could be built and tested in aircraft. But no one knew how to solve the re-entry problem.

Ballistic missiles fly out of the atmosphere, into space, and then re-enter the atmosphere at speeds high enough to burn to a cinder, like a meteor. Would it be possible to build a re-entry vehicle (popularly called a nose cone) that could survive the blazing heat of re-entry?

No one knew what re-entry conditions would be. No one knew how much heat would be generated as the re-entry vehicle blazed through air heated to incandescence.

Kantrowitz thought he could find out, in six months, using shock tubes to study the way air behaves at such high temperatures. The Air Force was eager to get such information; otherwise they would have to build full-scale rockets and test various re-entry vehicle designs on a cut-and-try method. If no satisfactory re-entry vehicle could be developed, all the effort and money spent on propulsion and guidance would have been wasted.

Avco Corporation offered Kantrowitz a free hand in selecting a site for

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his laboratory and staffing it. He picked an abandoned tire warehouse in Everett, Massachusetts, because it was close to intellectual Boston, Harvard, and MIT—and because the sailing was good in the summer. He staffed his new lab mostly with his own graduate students from Cornell.

In six months the needed data was in the Air Force's hands. Now that they understood the heat loads involved in re-entry, engineers could design practical re-entry vehicles. Avco Corp. became a major supplier of ballistic missile re-entry vehicles, and eventually produced all the heat shields for the Apollo command modules. You can see one of them at Smithsonian's Air and Space Museum in Washington, D.C.: the scorched but intact heat shield on the Apollo 11 command module that carried Armstrong, Aldrin, and Collins from the Moon safely back to Earth.

Most of that happened before the invention of lasers. It gave AERL's research staff a tremendous background in the physics of high-temperature gases. In fact, we were known nationwide as "hot air specialists." And proud of it.

Once the basic re-entry problem was solved, the lab's scientists began to investigate the problems of defense against ballistic missiles. The business end of the "ultimate weapon" actually consisted of a re-entry vehicle that streaked through the atmosphere like a meteor. Although you only had a few seconds before the re-entry vehicle triggered its nuclear weapon, you might be able to hit the incoming warhead with a missile of your own and destroy it.

It wasn't that simple. The attacker would not merely send one re-entry vehicle at you. The warhead carrying the bomb would be accompanied by decoys, dummy warheads, and even broken-up fragments of the missile itself. Down at ground zero you would see many meteors heading your way. In the parlance of the time, "which twin had the Toni?"

I have digressed quite a bit from the laser story, for two reasons: First, to show how AERL was founded and describe its early expertise; second, to establish its interest in ballistic missile defense.

As I said earlier, by the mid-1960s carbon dioxide lasers were achieving power outputs of several kilowatts, but they were definitely laboratory devices, long glass tubes surrounded by delicate equipment and harried technicians.

Yet the working fluid in any gas laser is a mixture of gases at high temperature. That was AERL's area of expertise: after all, we were hot air specialists, were we not?

Kantrowitz called his research staff together and asked why nobody had produced a truly high-power laser. He answered his own question. The problem, he said, was garbage removal. In this case, the "garbage" was heat.

As a laser operates it produces heat as a waste product. As the gas heats up, laser efficiency goes down. There were strict limits to the amount of power that could be produced by a carbon dioxide laser, for example, because of the waste heat it generated.

Getting rid of waste heat in a long glass tube is like using a septic tank: the

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waste heat trickles to the glass walls of the tube and then radiates away. Kantrowitz proposed what he called "a sewer line": *move* the gas mixture through the laser cavity and then out of it, while bringing in fresh gas. And move the gas at supersonic speed.

Thus AERL's scientists invented the gasdynamic laser. It operated somewhat like a rocket engine blowing its exhaust into a wind tunnel. The rocket's "propellants" were cyanogen (quite poisonous) and liquid oxygen; when burned they produced the carbon dioxide-nitrogen mix required for lasing.

The mix blew at supersonic speed through an expansion nozzle, where the carbon dioxide molecules "froze" in a high energy state. Then the gas flowed through a mirrored laser cavity and the CO_2 dumped its pent-up energy in an infrared beam of 10.6 microns wavelength.

There was a tremendous amount of energy bouncing around inside the gasdynamic laser's active cavity. The mirrors had to be thick slabs of highly polished copper, cooled by water lines drilled through them. That was fine for mirrors, but there was a problem finding a suitable material for the laser window.

The window allows the laser's beam to come out of the cavity so it can do useful work. In the earlier lasers the windows were usually half-silvered mirrors that reflected the energy beam until it built up to a level high enough to come through despite the silvering. The energy flux in the gasdynamic laser's copper-lined cavity was so high that no material to use as a window could be found: everything short of pure diamond shattered when the laser's energy poured through it.

So AERL's people invented the "aerodynamic window": a series of carefully aligned holes drilled through one of the copper mirrors, with nitrogen gas blowing across them on the outer surface so that the low-pressure gas mixture inside the cavity would not be contaminated by room-pressure air leaking into the laser cavity. The laser energy came out through those holes and collimated into a tight infrared beam.

We applied for a patent for the aerodynamic window, and in about a year received it, stamped top secret (of course). I brought the good news to Kantrowitz and suggested that we forget about lasers: since we now had a patent on a hole, I told him we ought to take over the doughnut industry. If my quip amused him, he hid it well.

The first gasdynamic laser produced an output of ten kilowatts as long as the gas flowed. An Air Force scientist, when informed of this breakthrough, marveled that our laboratory "kloodge" emitted more energy in ten seconds than all the lasers that had been built up to that time, put together.

I helped to arrange a briefing in the Pentagon to inform the top levels of the Department of Defense about the gasdynamic laser. It was truly a breakthrough, because the principle of using flowing (dynamic) gas in a laser could be applied to lasers that were electrically pumped, and even lasers that produced their energy by chemical reactions between elements such

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as hydrogen and fluorine.

The Pentagon briefing, in January 1966, was wiped out by a monumental snowstorm that clobbered the entire East Coast. I spent nearly twenty hours on a train battling the blizzard from Boston to Washington, feeling like a character from *Dr. Zhivago* being sent to Siberia. I was carrying all the top-secret slides for the briefing, you see, and if I didn't get there the meeting—scheduled for the next day—would be pointless.

I finally got into Washington around midnight. The storm had ended but the city was blanketed in two feet of snow. Nothing was moving. I hauled my suitcase full of slides through the drifts, on foot, from Union Station to the hotel, only to find a message waiting for me: the meeting had been canceled—naturally.

Several weeks later, in February 1966, the briefing finally took place. The Pentagon had brought together the nation's top experts in physics, optics, lasers and other associated fields. The long conference table was filled with the nation's leading scientists. And the slide projector wouldn't work.

None of the brilliant scientists in the conference room could fix it, so a tech sergeant had to be brought in. He wasn't cleared to see our top-secret slides, of course, so he had to bring a couple of test slides with him. Once he had the projector fixed, he was stationed out in the hall—just in case.

Our presentation took more than an hour. When it was finished and the ceiling lights came on again, there was a long, *long* moment of absolute silence. The nation's top experts were stunned by what we had accomplished.

The Defense Department moved swiftly, and in two directions. No, make that three. First, they funded AERL to proceed with the development of high-power lasers. Second, they established study groups to determine how such lasers might best be employed. Third, they ordered AERL to share their proprietary information with other companies, our competitors. This breakthrough was too big, DoD insisted, for the government to depend on only one source. We had to open up the game so the Pentagon would not be totally dependent on Avco.

The studies on how to use high-power lasers took some interesting twists. I found myself talking to people who drilled tunnels through hard rock, to oil-well drillers, to companies that cut and weld metals. I remember one gung-ho Marine Corps major who wanted a high-power laser to mount on landing barges, so his troops could sweep the beaches with a "death ray."

The most interesting possible application for high-power lasers, however, turned out to be in space. If a suitable laser could be mounted on a satellite, it could destroy ballistic missiles over ranges of thousands of miles. (See! The ICBM story was significant, after all.)

By 1971 I was editing *Analog* magazine and out of AERL. I kept tabs on what my colleagues were doing, within the limits of military security. Not only was I vitally interested in the work, but these guys were my friends. I had spent a dozen years of my life with them.

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(I am not naming any of them because there are so many, and because I'm sure to forget one or two and thereby hurt their feelings. So guys, pardon the anonymity, please.)

Time passed. The Cold War dragged on, with both the Soviet Union and the US pouring trillions of dollars into more and more ballistic missiles, hydrogen bomb warheads, nuclear submarines, jet bombers, hardened missile silos.

The conventional wisdom, since the earliest days of thinking about them, was that ballistic missiles were "the ultimate weapon." No defense against them was possible. Over the years, this became hardened (in the US) into the position that no defense against them was *desirable*.

The basic policy developed in Washington was called Mutual Assured Destruction (MAD). We would build enough nuclear weapons, and the means to deliver them, so that even if the Soviet Union launched a nuclear attack that would utterly destroy America, our retaliatory strike would utterly destroy them. It was a sort of mutual suicide pact. At least, we hoped it was mutual.

The name of the game was deterrence. Neither side would dare to strike the other, for fear of that return clout. And it worked for several decades.

But when your policy is Mutual Assured Destruction, how many missiles do you need to *assure* your enemy's destruction? Every time the Soviets added a new missile to their arsenal, we added to our own. And vice versa.

There were attempts to slow down this arms race by treaties, but they merely ended in both sides developing faster, more accurate, deadlier weaponry. One of the treaties, the 1972 ABM Treaty, required both sides to refrain from developing defenses against ballistic missiles. The mutual suicide pact was signed into law.

But the idea of developing orbital defenses against ballistic missile attack did not—could not—evaporate. The possibility of using satellites to shoot down ballistic missiles within seconds after their launch stayed alive. In fact, two different kinds of weapons were envisioned for such defenses: lasers or particle beam accelerators (energy weapons) or small, fast missiles that destroyed ballistic missiles by ramming into them at hypervelocity speeds (kinetic weapons).

Comes 1983. President Reagan announces the Strategic Defense Initiative. The media immediately dubs it "Star Wars," and calls it a wild-eyed scheme by a former movie actor[1]. Most academic scientists oppose it—especially a cadre of strategic thinkers out of MIT (Vannevar Bush's spirit lives on).

Some of the scientists who bitterly opposed SDI were friends and associates of mine. It took me several years to realize that they were also men who had spent their entire professional lives developing nuclear weapons—and then trying to develop policies such as MAD to deter their

[1] My doctoral dissertation, "Influence of Mass Media on Public Understanding of a Science-Based Public Issue," documents the lopsided media coverage of the SDI issue.

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use. The idea of a workable defense against ballistic missiles struck them as hard as Martin Luther hit the Roman Catholic Church.

While the arguments for and against SDI raged, the Soviet Union collapsed. Margaret Thatcher, former British Prime Minister, credits SDI with neutralizing the Soviet military[2] and thus hastening the reforms that led to the Soviet Union's demise.

In a sense, then, SDI worked even though it had not been built.

Meanwhile, although the threat of a massive missile attack against the US has abated (but not disappeared), missile proliferation has become a serious problem. As one wag put it, instead of a monolithic USSR with thousands of missiles aimed at us, we now face a thousand little countries, each with at least one missile.

The 1990-91 Gulf War saw Iraq firing relatively short-ranged Scud missiles into Israel and Saudi Arabia. One Scud struck an American military barracks and caused more casualties than the entire Iraqi army.

The American defense against the Scuds was twofold: try to find their launchers and destroy them with air strikes, and try to shoot down incoming Scuds with our own Patriot missiles. There is an ongoing debate about how successful the Patriot was in shooting down Scuds. The debate misses the point. Whether or not the Patriots worked, *the Scuds did.*

Today, more than twenty Third World nations possess Scud-type ballistic missiles or their longer-ranged cousins. Nations such as Iraq, Iran, and North Korea are actively developing missiles that have ranges of thousands of miles. Topped by nuclear, chemical, or biological warheads, these missiles pose a terrible threat.

Other nations, such as China, Israel and India, already possess nuclear weaponry.

The SDI idea, the concept of developing satellite-born defenses against these missiles, has bumped into political haggling in Washington. Running generally along party lines, Democrats say it's too expensive to build an orbital system that will defend the US—and it's a violation of the 1972 ABM Treaty—while Republicans say that defending America is not too expensive and the ABM Treaty can be amended or scrapped altogether.

While the Russians have demolished some of their missiles and retargeted the rest, they still possess enough nuclear firepower to fry us several times over.

As this debate continues inside Washington and between Washington and Moscow, the US Air Force is facing the growing threat of Scud-type missiles and their successors threatening American troops and bases overseas.

So the Air Force in November 1996 awarded a $1.1 billion contract to a team composed of Boeing, TRW and Lockheed Martin to build the YAL-1A: a Boeing 747 that will carry a TRW chemical laser capable of shooting down ballistic missiles over a range of several hundred miles.

Shades of Buck Rogers! The 747 is intended to fly over friendly territory,

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[2] Margaret Thatcher, *The Downing Street Years*, HarperCollins, New York, 1993.

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detect missile launches from enemy territory, and reach out with its laser weapon to destroy the missile within seconds of its launch.

This is something we talked about during brainstorming sessions at AERL back in the Sixties. The fighter plane of the future, we conjectured, won't be a nimble, sleek beauty piloted by a jut-jawed jet jockey. Instead, it will be a big, lumbering four-engined plane carrying a very powerful laser that strikes with the speed of light.

The laser lummox will be able to defend itself against enemy jet fighters and missiles—as long as the fuel for its laser holds out.

Interesting to see how the ideas develop as the technology matures. Over the intervening years Kantrowitz retired from Avco and now is a professor at Dartmouth. Avco Corporation itself was gobbled up by Textron, and AERL no longer exists as it once was. Yet the technology continues to develop and change the world.

There is another idea that has yet to become reality. The technology of lasers and kinetic-kill systems such as Brilliant Pebbles can one day result in a fleet of defensive satellites orbiting the planet, ready to shoot down ballistic missiles as soon as they are launched.

If we can develop our political systems to match the sophistication of this technology, we can produce a network of defensive satellites that will destroy *any* ballistic missiles launched from *anywhere* on Earth and aimed at *any* target. Those satellites will orbit the whole Earth; they can be used to protect everyone.

This was the background against which I wrote my novel *Millennium*, originally published in 1976 and reissued several times since. I pictured a missile defense system that would automatically destroy any missile launched from anywhere on Earth. The international authority managing the system would have to inspect the payloads on scientific and commercial launches, to make certain they are non-threatening. No inspection, and the rocket is destroyed on launch by the defensive system's satellites.

I feel certain that such a day will come. Over the past thirty-some years I have watched global politics and military tactics follow the road that various technologies have carved out. We will eventually orbit such a global protective system because we will need it.

Perhaps it will take a nuclear exchange between India and Pakistan to drive us to a global ABM system. Perhaps a terrorist strike against an American city. History shows that we often wait until the threat is painfully obvious before we take steps to protect against it.

The technology is there. Now we must encourage the politicians to adapt their thinking to the possibilities of the future. Or as George Bernard Shaw wrote in his play, *Caesar and Cleopatra:*

And so, to the end of history, murder shall breed murder, always in the name of right and honor and peace, until the gods are tired of blood and create a race that can understand. ■

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Jerry Oltion

CEASE AND DECEASED

Some jobs have really unusual qualifications—which can lead to both reluctance and legal complications!

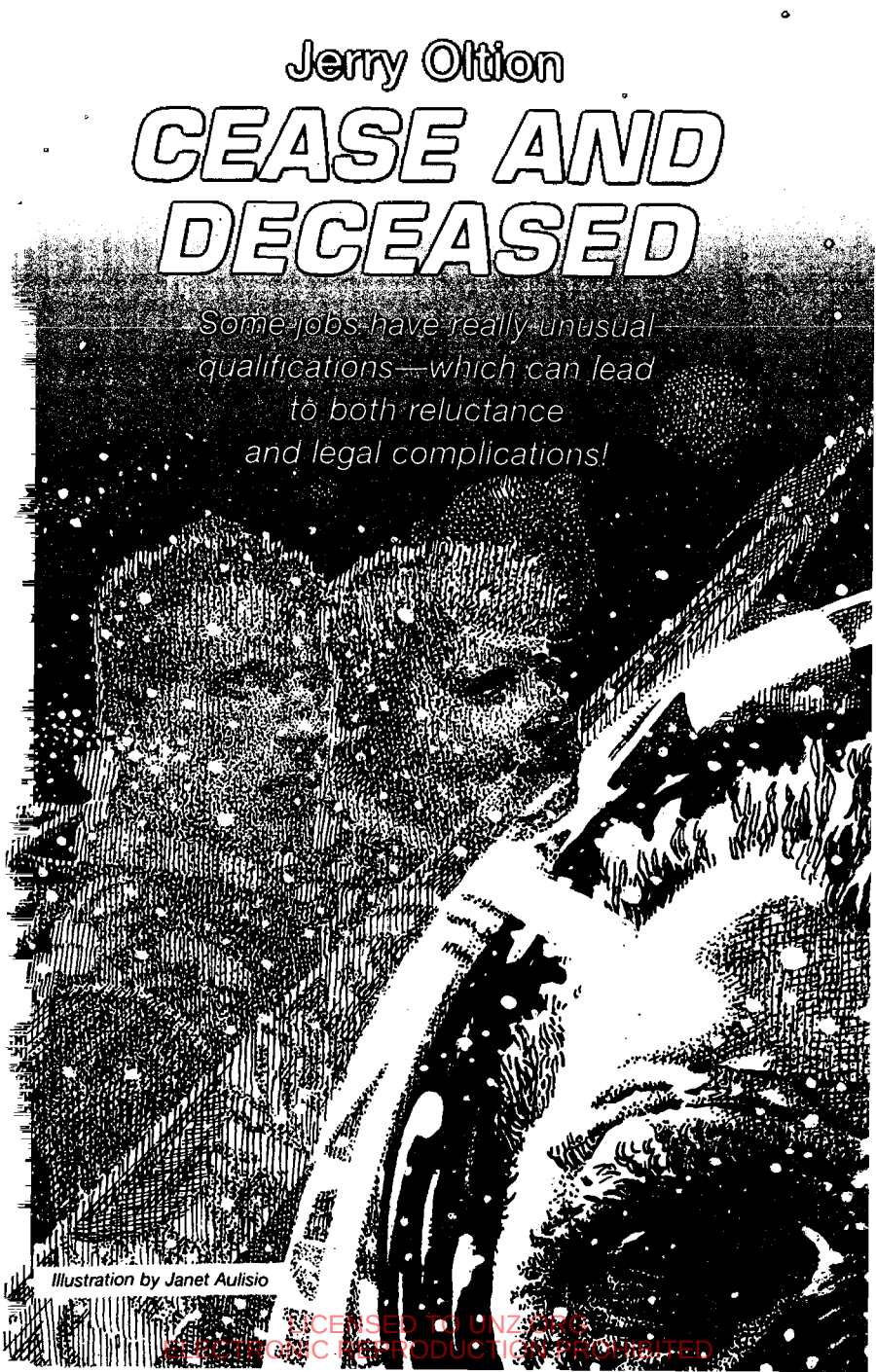

Illustration by Janet Aulisio

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It wasn't the most beautiful starship ever conceived, not with a budget of only half a billion dollars. It was mostly just an open framework atop an Orion class fusion rocket, but the *Spook* had one big advantage over anything else that had ever been built for interstellar travel: it could carry passengers.

Of course they had to be dead first, but that was no problem for Tilbey and me. We had plenty of experience at it by the time the ship was ready to fly. Liam, on the other hand, still hadn't made the transition, and it was coming right down to the wire.

"So when are you going to snuff it?" Tilbey asked him one afternoon while we were working on the magnetic trap that would hold us in place while the ship was under thrust.

All three of us were outside, hovering around the payload section and getting in each other's way while we replaced a blown coil in the magnetic restraint system. Liam was all thumbs in his pressure suit, but Tilbey and I were little better. We didn't need suits anymore since we didn't need air, but in our incorporeal state we still had a hard time holding onto anything. And when we slipped through normal matter, the magnetic fields that made up our "bodies" played hell with electrical circuits.

Tilbey had already blown a couple of expensive superconducting coils, which Liam had to replace since he was the only one of us substantial enough to twist a wrench, so Liam wasn't exactly in the best of moods when Tilbey asked his question. Liam looked over at him, a man-shaped patch of thick fog—or maybe whipped cream—wearing a neck collar and a computer that interpreted his throat, tongue, and lip movements into a synthesized radio voice so he could speak even in vacuum, and said, "I'll snuff it when I'm sure we don't need a live hand to fix your mistakes anymore."

Liam had joined our team not long after we'd started, after an unfortunate incident in which Tilbey had nearly scared him to death. After we'd revived him and told him we were trying to build an interstellar starship he had been eager to come along, but now that he knew more about the downside to being a ghost he wasn't so hot to make the transition.

"Don't go blaming me for your cowardice," Tilbey said.

Liam might have been ninety years old and fragile as a butterfly, but he was still an ex-marine and didn't take much sass. "Here, hold this," he said, and he parked his counter-torque nut driver in Tilbey's chest before Tilbey could reach for it with his hands.

Tilbey said, "Hey, watch it," and pulled the nut driver free. His hand slipped through it just as it came out of his chest, though, and the nut driver tumbled off into space. It flashed bright silver as it caught the sunlight coming from off to our left, just above *Freeport,* the UN orbital space station we called home until we finished our ship.

I kicked off after it and caught up within a couple of seconds, but then I had to tuck it into my belt and flap my way to a stop. I still felt silly doing that, but it was the only way for a ghost to maneuver in space. Tethers

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wouldn't hold me, and a reaction pistol would have blown right out of my hand, so we had to rely on interactions between the Earth's magnetic field and our own. And since magnetic fields interact best when there's movement, that meant flapping my arms.

I flew/swam back to the ship and handed Liam his nut driver. By the time I got back, he had removed the burned-out coil and replaced it with a new one, so he took the driver from me and tightened the clamps holding it into place. "There," he said, "Good as new. Now keep clear of it this time."

"Yes, Mom," Tilbey said, all hangdog. He had programmed his voice synthesizer for that nuance after the first month of working with Liam.

We couldn't keep *too* clear of the coils; under the fifty *g*s of acceleration the ship was capable of we were going to have to tuck ourselves right in next to them in order for them to get enough of a hold on us to keep us from falling right through the deck. We had built three body-sized slots to stand in, and static tests had been promising, but we wouldn't really know how well they would work under thrust until we tried it.

At least we didn't have to worry about the propulsion system. The *Spook* was really just a modified Centauri probe without the instrument package, and the UN had already sent out five of the original article without a hitch. Two of them had gone toward Alpha and Beta Centauri, one to Epsilon Eridani, one to Barnard's star, and one to Tau Ceti. Of course they would take decades to get to their targets because they didn't have Tilbey's mass eliminator to reduce the payload weight, and thus their top acceleration had been less than a *g*, but the engine design and navigational system had been proven in action so we weren't worried about that. We just needed to make sure that our modifications would actually let us ride along.

"So when are you going to take it for a test flight?" Liam asked.

"Not 'we'?" Tilbey asked him right back.

Liam slammed the meteor shield closed over the circuitry. "Don't push me," he said. "You prove it's worth doing, then we'll talk suicide."

"Don't think of it that way," Tilbey told him. "Think of it as a transition. You trade your meat body for a magnetic one that will let you do a lot more."

"Yeah, yeah," Liam said, waving his arms in dismissal. "I've heard the pep talk before. But I've grown kind of fond of this old bag of bones, and frail as they are these days, I'm not quite ready to trade 'em in yet."

"Look, *we* did—"

"Stow it, Tilbey," I said. "We both bought it in accidents. That's not the same thing as ending your life deliberately."

"Exactly," said Liam.

As I helped gather up the rest of our tools, I said, "We can test the system, just the two of us. Take it out to Pluto or somewhere and back. That'll give Liam time to tie up all his loose ends and get his affairs in order, and it'll give us a chance to figure out what we've forgotten before we take off on the big trip."

Tilbey nodded. "All right, but I don't want to wait around forever."

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Liam laughed. "You sound like my nephew. He can't wait until I kick off and he inherits my condo in the hub. He's still healthy as a horse, but he's seventy-two so he thinks he needs a zero-g habitat." He shook his head. "Kids."

Tilbey didn't respond to that, being almost sixty years younger than Liam. And I was younger than Tilbey by a few years myself. Young enough, in fact, to wonder if Liam might not know a few things I didn't about life. Like maybe how to let the kids take all the risk while he kicked back and waited to see how it would turn out.

But I was already committed to the project, so it didn't really matter even if that was the case.

So a few days later it was just Tilbey and me who slipped into the body cages and turned on the magnets. We had adjusted the standing wave generator that kept us alive so that we were nearly insubstantial, which meant we had practically no mass but at the same time we had very little natural interaction with matter. Without the magnets we would have slipped through the ship like light waves through glass the moment we lit the drive, but as it was I felt myself held in place so tightly I couldn't even scratch an imaginary itch. Nor could I operate any of the manual controls built into the open framework just before me, which meant we were reduced to vocal control.

"Command, engage control voice," I said. My speech synthesizer switched from my own digitized voice to a completely artificial "pure" voice that theoretically provided a cleaner signal for the off-the-shelf control circuitry we had robbed from a UN suborbital scramjet. "Command, visual display on," I said, and through my mastoid speaker implants I heard what sounded to me like a Norwegian who'd spent time in the Middle East speak the words aloud. We were in vacuum so the synthesizer played straight into the computer's microphone port, but I heard the echo in my ears and it sounded like speech.

The heads-up display winked on: a ghostly set of gauges superimposed on black space beyond. To the left of it, Earth made a curving blue-and-white wall. I was used to the sight after a year of living in orbit, but I still gave it a glance. It might be a while before I saw it again.

After a moment I looked at the gauges for anomalies, but everything looked go. "Tilbey, are you ready?" I asked.

"Ready," he replied, his voice just as Norwegian as mine. "Mars first?"

"OK. Command, set heading for Mars, direct route, no correction for gravitation." I got to give the orders, since the control system was my baby. The mass-eliminator was Tilbey's responsibility.

"Warning," the computer replied. "Direct course intersects geosynchronous satellite orbit. Emergency authorization required for transit."

"Oh, hell. All right, take us around geosynch, then give us the most direct allowed route."

Nothing happened.

Tilbey laughed. "You forgot to say, 'Simon says!' "

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"Go screw yourself," I told him. "Command, take us around geosynch, then give us the most direct allowed route to Mars. Command, use one-half gravity acceleration. Command, execute."

The ship spun around fast enough to be disorienting. We'd Tilbey-ized the mass out of practically everything but the fuel, so the ship was *light*. Even the smallest of the attitude jets really kicked it around. I hoped that the main engine could throttle down low enough to give us just half a *g*; if not, we might get a sudden surprise.

When the nose of the ship pointed away from Earth, the computer started the fusion drive. Even though we'd done countless tests and calculations on the strength of the holding field required, I still half expected to fall through the deck, but the field held. I looked at the aft view in the heads-up display and saw Earth begin to slide away behind us.

"Command, increase thrust to one *g*," I said. I hardly felt any change, but the Earth dwindled a bit faster now.

"Are you hanging on OK?" I asked Tilbey.

"Fine. Go ahead and run it on up a few more *g*s."

So I gave the computer the commands, one *g* at a time, until we were accelerating toward Mars at thirty *g*s. I felt a bit of vibration, but no discomfort, and the holding field had no trouble keeping me in place.

Earth was about half-sized behind us by then and the Moon was just a small bright dot beside it, only fifteen minutes into the flight. I checked our velocity: 304,000 miles per hour. If we shut the drive down now we could coast to Mars in a week, which was about as good as the hottest courier ships could do it and they boosted all the way.

We didn't stop. We didn't even hold at thirty *g*s. After a couple of minutes to make sure nothing would shake loose, we ran it up to thirty-five, then forty, then finally all the way to fifty. That was full power from the engines, but they were tuned to run at full for weeks, so at that thrust everything settled down and the ship seemed steady as a rock.

Five hours later we flashed past Mars like a bullet past an apple. We got practically no gravity assist at that speed, but it hardly mattered; by then we were doing nearly 2 percent the speed of light and still gaining. Not much on the interstellar scale, but plenty fast to cruise through the Solar System. In fact we had already broken the speed record for a manned vehicle. I radioed that news back to Earth, then ordered the computer to loop us around toward Saturn, which, since Jupiter was on the other side of the Sun, was the next closest planet. Just to be safe we took the ship up above the plane of the ecliptic and skirted the asteroid belt, then dropped back down to roar past at 8 percent of light-speed.

That took another fifteen hours, after which we turned around and slowed down so we wouldn't shoot on out into interstellar space. We didn't want to do that yet, not until we could pick up Liam and load the ship with spare parts. And load the computer with a pocket World Library

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to help keep us sane throughout the long interstellar voyage. Even at fifty *g*s acceleration and accounting for time dilation, once we approached light-speed it would take us months of subjective time to get to Alpha Centauri. The Galaxy is a big place.

The Solar System isn't all that small either. It took us just as long to get back as it did to reach Saturn, blasting away at fifty *g*s the whole distance. We beamed a news release home ahead of us to announce our great success, and prepared to face a gaggle of reporters when we got home.

So we were completely taken by surprise when we pulled into our old parking orbit next to *Freeport* and were met by a single UN peacekeeping ship. And when its captain, a French woman named Cluny, told us to stand down for boarding, we grew even more befuddled.

"What, did we break the speed limit or something?" Tilbey asked her.

She didn't laugh. "You are charged with conspiracy to commit murder, and your ship is being impounded as evidence."

"Murder?" I asked. "What are you talking about?" Then I realized what it had to be. "Wait a minute. Is this about Liam? Is he all right?"

"He is alive, yes," she said. "No thanks to you. You'll be read a list of charges at your arraignment. Now surrender your ship and come across to ours or we'll be forced to remove you from it by force."

I would have liked to see her try that, but I learned when I was a kid not to harass the cops. Save your protest for the people who actually decided your fate: the lawyers and the judge.

We did do one thing in preparation for our trip through the legal system: before the cops boarded us Tilbey said, "Command, adjust coupling constant to 20 percent. Command, lock controls to my voice or Danbury's voice only."

The coupling constant determined the strength of our interface with normal matter. I felt myself grow less substantial as the computer complied with Tilbey's order; I was able to swing my arm through the support beams around my body cage without hindrance, and my vision grew less distinct as my eyes intercepted less light. We had determined through experimentation that 20 percent was the lower limit of usefulness. It was even lower than what we'd used to fly with. Much below that and we could barely interact with the "real world" at all. But unless the cops had a magnetic confinement cell already set up for us, we could walk right out of any place they tried to lock us into.

I wondered how long Tilbey's precautions would keep the cops out of our computer. Long enough, I hoped, to straighten things out with the law and get Liam installed aboard the *Spook* so we could get on with our trip to Alpha Centauri, but I wasn't making any bets.

When the UN forces arrived, we were as cooperative as we could be without turning up the coupling constant. That was a considerable relief to them, I'm sure, because handcuffs slipped right through our wrists un-

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less we held completely still, and we couldn't ride the shuttle back to the station because we fell right through it the moment the pilot fired the thrusters. So we wound up swimming across to the *Freeport* and joining our would-be jailers in the hub, where we were led to a holding cell that wouldn't have held us for ten seconds if we wanted to leave. But we behaved; we wanted to get to the bottom of this with as little fuss as possible.

Apparently so did the UN cops. We were escorted to the judge's chambers within an hour, where we learned the situation. It turned out Liam's nephew had caught wind of Liam's plans to join our crew, and he'd suddenly had a change of heart. He didn't want dear old uncle to leave him all alone, even if he did get Liam's zero-*g* condo, so he'd filed papers to prohibit euthanasia and had filed charges against us for exerting undue influence over an invalid.

Nothing makes a guy want to do something more than being told he can't do it. When we had left him three days ago, Liam had been waffling worse than a newly elected president, but now he was all hot to jump out an airlock in his skivvies—provided Tilbey's mass eliminator was ready to catch him when he did it.

And therein lay the problem. Despite the UN grant that had let us build the starship and despite Tilbey's and my persistence for nearly a year as "artificially augmented post-vivo standing waves," our procedure was still experimental as hell and UNMed wouldn't OK it for Liam. Nor was he sick enough to qualify for the Kevorkian assisted suicide exemption, so he couldn't use that route, either. And if he intentionally impaired his own health so he could qualify, *we* would be liable for undue influence over the elderly.

Never mind that Liam was still perfectly capable of deciding his own fate, or that his nephew was the one forcing his hand. The law had been set up to protect people's lives, not help end them, and that's what it was going to do in this case as well.

After the charges were read we had a chance to talk with Liam in one of the private meeting rooms off to the side of the courtroom. His lawyer had to be present, of course, and so did our court-appointed council, but that didn't slow him down any. As soon as we sat down—Tilbey and I somewhat delicately in our wispy state—Liam woke us right up with an astute observation.

"Don't you think it's kind of convenient timing that this all happened right after you proved the technology works?" he asked us. He looked over at his lawyer, an East Indian woman named Indira who seemed kind of uncomfortable being in the same room with two ghosts, and said, "Find out who got to my nephew. That greedy bastard has been waiting for me to kick off for twenty years; I guarantee you he doesn't give a damn about me now. He wants a piece of a bigger pie."

"Oh, that much is obvious," Indira said. "There are at least five different factions, starting with the UN peacekeeping force, who would love to get their hands on this technology. Since

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the UN are the ones who actually took possession after your nephew's legal action, I'd suspect them first."

"So how do we fight them?" I asked.

Our lawyer, a young kid fresh out of college by the looks of him, regarded me skeptically. "They're the UN," he said. "They do have to obey the laws, but unfortunately very little law applies to you, since you're legally dead."

Liam laughed. "Well, they can't desecrate your grave, then. Can we call the *Spook* your tomb or something and at least keep them out of there until we get my nephew off my back?"

"It's worth a try," our lawyer admitted.

"What else can we do?" I asked. I didn't like the idea of relying on legal maneuvering to get us out of this fix.

Neither did Liam. "How about if I challenge someone to a duel and lose?" he asked.

Indira laughed. "You wouldn't even have to lose. Dueling is a capital crime, so the court would be compelled to execute you if you won. Of course the automatic appeals process would take at least five years to work through before they actually carried out the sentence, so you'd be better served to let your opponent win."

"Fine. So who wants to fight a duel?" Liam asked.

Nobody spoke up.

"Chickens," he said.

I shrugged. "I'd volunteer, but I'm already being held for conspiracy."

"Maybe you could choke on a chicken bone," Tilbey suggested.

Indira said, "The way I understand it, Liam has to be in close proximity to the, um, ghost generating device when he dies, or it may not lock onto his, um, his essential pattern of existence, isn't that correct?"

"We don't know for sure," Tilbey said. "We've been parking the *Spook* two miles from *Freeport* so it won't capture anyone who dies here, and it seems to have worked so far. On the other hand, I was nearly fifty feet away from the prototype when I was killed and it still picked me up, so you probably don't have to be right on top of it the way Danbury was."

"But what you're saying is you really don't know the range of this device of yours," our lawyer said.

"Not really," Tilbey said. "We know it can keep us stable for thousands of miles once we've been captured, but we haven't exactly had a lot of opportunity to test the acquisition phase."

Indira nodded. "So to be safe, my client would have to choke on his chicken bone in close proximity to your ship. I think we would have a hard time convincing anyone that it was an accident."

Tilbey said, "How about if we crashed the ship into the station while he's having lunch? The surprise scares him into swallowing wrong, and—"

"Stop," our lawyer said. "I know you're just being facetious, but these statements could be used against you to prove your intent to conspire against Liam's life."

"Well damn it, we've got to—" Tilbey began, but he stopped when our bodies suddenly grew more distinct.

"Somebody's tinkering with the ship," I said. I stood up and backed

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away from my chair so I wouldn't be inside it if they turned the coupling constant all the way up. I'd accidentally materialized inside one of the engine parts once, and it had been painful as hell.

Or they could turn it the other way. I shivered at the thought. "We've got to get them out of there before they shut us off," I said, heading for the door.

"Where are you going?" our court-appointed lawyer asked. "You can't return to your ship until the injunction is lifted."

"If I don't get back there pretty soon," I told him, "whoever's fooling with the mass eliminator could flip the wrong switch and—"

"I give up," Liam suddenly said. "My nephew wins. I won't kill myself."

"Huh?" I asked.

Liam nodded to the lawyers. "I say so in front of witnesses, and I'll do it again in front of the judge if necessary. I won't kill myself. My mind is made up, so there was no undue influence on Tilbey's or Danbury's part, which means there's no case against them, which means no one but them has any right to be aboard the *Spook*. So call the judge in here and let's get this cleared up once and for all."

"Are you serious?" I asked. "Don't you want to go to Alpha Centauri with us?"

He nodded his head. "Of course I do. But if I've learned one thing in ninety years, it's how to be patient. So I'll just stay here and keep my idiot nephew from living in my condo for another twenty years, and I'll go with you on your *next* trip."

It wasn't that simple, of course. Convincing the judge to drop the charges against us took most of the afternoon, and only when I "accidentally" slipped through his records computer and blamed the resulting explosion on the people tinkering with our interface did he finally expedite the paperwork and order the UN investigative team off our ship.

Liam met us in the airlock on our way out. We had to go out the normal door since the investigators had left our coupling constant turned way up and we couldn't slide through walls anymore.

"Are you sure you don't want to come along?" I asked him. "We can fight this. Eventually you'll die of natural causes, if nothing else, and then we can all three go to Alpha Centauri."

"Hah," he said. "And by then the damned UN will have beat us to it and stolen all our thunder. No, you've probably got a day, maybe two at the outside, before they impound your ship again on some other trumped-up charge and ground you for good. So get it refueled and ready to fly *today*. They won't let me within a mile of the *Spook*, so I'll just have to see you off here, and you're going to have to make the trip on your own."

I couldn't believe that he would voluntarily stay behind, not even considering what it would cost him to go. But he sounded sincere, and I remembered his earlier reluctance to take that final, irrevocable step.

"Good luck," he said, holding out his hand.

"Well," I said, reaching out with my own, "what can I say? We'll miss you."

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We shook, and his grip was strong enough to press into my hand a ways. When he withdrew, I felt something left behind inside my palm.

He winked. "See you later," he said. He shook Tilbey's hand, too, but if he left anything there, Tilbey didn't let on.

Later, back on board the *Spook*, I fished his note out of my palm. It wasn't much, just a line scrawled quickly on the torn-off corner of a napkin: "8:15, my place. Bring the ship."

"What the hell does that mean?" I asked Tilbey, showing him the note. "We can't dock the *Spook* with *Freeport*."

He rubbed his chin in thought—an old habit from the days when he'd had a chin substantial enough to rub. "No," he said, at last, "but we can do something almost as good."

We had the tritium tanks topped off by 6:00, and had downloaded all the library and video information our computer could hold by 7:00. At 8:00 we warmed up the engines and slotted ourselves into our body cages. And at 8:10 the radio beeped for attention.

It was Liam. "Thought I'd call and wish you guys a good trip," he said. "You about ready to go?"

"Pretty close," I answered. "Are you, uh . . ."

"Open channel," he reminded me. "But yeah, I'm watching from my window. I expect to see a pretty impressive flash when you light the drive."

"Well, we're ready any time you are," I said.

I could hear him breathing hard. "Give me a minute."

"Roger."

But a moment later another voice said, "This is *Freeport* traffic control. You are not cleared for departure. Power down your engines immediately.

"Under what authority?" I asked.

"United Nations Security Council," he replied.

"Roger," I said, putting as much reluctance into my voice as I could muster. "Powering down." And I even said, "Computer, take engines off-line."

The command phrase wasn't "Computer," but only Tilbey and Liam and I knew that.

"Go," Liam said.

"Command, execute," I said, and the course I'd already programmed into it engaged. Fifty *g*s for six seconds, a hellishly fast spin-around under high-power attitude thrusters, and fifty *g*s for another six seconds brought us to a stop twenty feet from *Freeport's* central hub—just outside Liam's bubble-shaped condo that stuck out from its central stalk like one grape in a bunch of them.

"Good-bye, cruel world," Liam said. He laughed maniacally, there was a loud *bang* over the radio, and big curved glass shards flew past the ship. He'd blown up his entire condo.

And a few seconds later a man-shaped patch of fog swept past. It made a grab for the open framework of the ship, but missed.

"There he is," I said. "Command, track and match velocity with object in screen sector—" I read the edges of the grid in the heads-up display "—beta-seven."

The ship surged away from *Freeport* and caught up with the

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ghost, and this time he was able to grab hold and pull himself aboard. "Watch out for the coils!" I said as he positioned himself inside the third body cage, but he couldn't hear me until he pulled on the throat collar and stuck the mastoid phone into his jaw. He'd replaced enough coils to know to stay clear, though.

He reached forward and punched the manual control that turned on his restraint field, and said aloud his first words since the explosion: "Step on it."

"Command, full speed straight ahead," I said, and *Freeport* dwindled to a speck behind us within seconds.

"Welcome aboard," Tilbey said.

"Thanks," said Liam. "Man, this feels strange."

"Are you OK?" I asked, suddenly concerned that something had gone wrong with the interface.

"I'm fine," he said. "This is the first time in thirty years that I haven't hurt somewhere, that's all." Then he laughed, a long, throaty laugh that went on and on.

"What's so funny?" Tilbey finally asked when he'd settled down a bit.

"Everything is," Liam said. "But my nephew in particular. He inherits my condo. Every blessed shard of it. I'd love to see his face when he learns that he's got to clean up the debris." ■

Editor's Note: This story is a sequel to "Unfinished Business" (October 1996), "The Spectral Stardrive" (November 1996), and "Holiday Spirits" (January 1997).

A computer lets you make more mistakes faster than any invention in human history—with the possible exceptions of handguns and tequila.

—Mitch Ratcliffe, *Technology Review*, April 1992

Since commercialism cannot sell brains, but can sell trousers or a dress, it establishes semantic standards whereby a man is evaluated by his clothes and hats.

—Alfred Korzybski

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David J. Strumfels

DREAM TO LIVE BY

"By our collective bootstraps . . ."

"I'm not sure how to explain this, but . . ."

He tried. He showed me the device. "Don't ask me how it works though. I'm an engineer, not a physicist. I didn't even build it. Found it. All I know is how to make it send me where I want to go. Excuse me, *when* I want to go."

The crazy thing was, I wasn't scared. I mean, what if someone materialized out of thin air right in front of you? Especially if it were very late at night and you were alone? I don't know; maybe I figured that somebody who could do that could do any thing he pleased, so what was the point of being scared? If he wanted me dead—or whatever—I'd be that way. So I wasn't scared.

And like I said, he tried to explain. Someone who means you harm doesn't usually do that. But it was all hopeless. Time travel is one of those things that just can't be, according to the way my mind works. It's like ghosts: even if I saw them with my own eyes, I probably still wouldn't believe it. I'm just not the sort of person who can believe things like that.

Then he told me *who* he was, and I really didn't believe it. Jesus Christ, he was an old man, for crying out loud. And me, I was—am—just a kid. Who can't even think of himself as being old, for God's sakes. So how was I supposed to. . . ?

"Forget it, then. I didn't come here to talk about dumb things, like paradoxes and the nature of reality. I'm here for something more important than that. Come on, I'll show you."

He took off across the dunes. That was also eerie, the way he knew which way to go. Ever since my folks bought our summer home three years ago, I'd been taking these nightly strolls along the beach when I can't sleep, which is often. There's something about the salt air, and the rush and crash of waves and rustle of grasses in the sand, in the darkness that thrills me, that opens my mind to things that seem impossible by day. But how the hell did he know that? Unless he really was—I shook my head and took off in a trot to catch up to him.

"If you didn't build it then where'd you get it?" I demanded, once my breathing had calmed down; that's an-

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other thing about the strolls, it helps my asthma, though the doctors don't know why. "And don't tell me you bought it at a store." I didn't need to be told *that* obviously.

"I told you, I found it." He stopped for a few moments, a little winded himself. At his age, who wouldn't be; then I realized, maybe it was more than just age; maybe it was a bit of me coming through— "Don't ask me where, though. *That* I'm sure as hell not going to tell you." He chuckled, as if at some private joke. "I don't know, maybe some careless traveler left it behind. Or maybe I was supposed to find it, so I could come here and do what I'm doing." He shrugged. "More dumb stuff. You might as well ask why any of us are here, or what's the meaning of life. Ah, here we are."

We'd reached the top of the highest dune, and were now looking down on the southeastern edge of the bay. It was a pretty sight; a waning three-quarters Moon was rising right over the black waters, sending a dancing rope of yellow light right down to the shoreline. A bright star hovered just a couple degrees over her, a diamond atop a pearl.

"It *is* beautiful," he said wistfully. I thought I caught some tears at the corners of his eyes; but maybe it was just the way the moonlight was reflecting from them. "I can see why . . ." He shook his head. "Of course, from here it's so small." Then he chuckled again. "Of course, from there we're even tinier.

"Come on, sit down. Take a load off an old man's legs."

We sat in the sandy grass. I felt the night moisture seep into my trousers, the way it had the last hundred times I'd been here. And damn if the old guy didn't sit like I always did, his arms wrapped around his knees, his heels dug into the ground. Spooky as hell.

And believe it or not, we sat like that for a long time, just gazing into space and feeling that coolness and saying nothing. Which is also crazy, I know; but it was like he had me hypnotized or something. I mean, he really just couldn't be what and who he said he was, but I know what I'd seen and was seeing and there was no other explanation I could think of, not sitting there like that. I just couldn't think of a single thing to say or do.

"Look," he finally broke the spell, at just about the time I couldn't stand it any longer. "I just want you to know one thing before I begin. And that is, you're not nuts. Understand that? You're not. I'm not saying that there isn't such a thing as being nuts, because there is—believe me, there is, as you're going to find out soon enough—but it's got nothing to do with you. Not now, and not ever. Understand?"

He was staring at me hard when he said that. Hard the way my father did, when he wanted to make sure I got his point. I swallowed. "Yes sir."

"Sir?" His eyes rolled skyward. "OK. No problem. Call me sir if it makes you feel good. Actually, people don't show respect like that much anymore. Maybe they should. . . .

"But I'm getting off the subject. Bad habit I've gotten into since I retired, I'm afraid. Retirement gives you too much time to—" He grinned. "Piss away. Shit, this isn't easy."

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A shock went up my spine; no adult had ever used *that* word in my presence, at least not so carelessly. It made me—well, maybe not exactly start to believe, but at least wonder. "I'm really your grandfather?"

"You want a DNA analysis or something? No, don't ask; I shouldn't have said that. Look, maybe if I tell you what I retired from it'll make things easier. See that point of light above the Moon?" He pointed skywards. "That's the planet Jupiter. That's where I worked. Well, not on Jupiter of course; we were actually in orbit around Europa, one of the moons. But that's not important. What's important is what I was doing there. You know what that was? Building the first interstellar spaceship, that's what. That's right, the first ship to go to the stars. There, how does that grab you?"

I don't know what made me say it. I guess it was just too much for me to grasp all at once. But looking back, it was a pretty stupid thing to say. "It grabs me just fine, I guess."

"You guess? You *guess?!* Jesus Christ Almighty! Don't you have any idea . . . we're going to the stars, boy! To the stars!"

That's really the way he said it. You should have seen his face, too: it was all lit up, just like the Moon in front of us. I swear you could have read by the light of his face. All of which, again, should have made me scared, but didn't. In fact, I really didn't know how to react. I guess it was just too big a thing for my mind. The stars? You might as well talk about going to the—well, about going to the stars.

And then the strangest thing happened. OK, a lot of strange things happened that night, but in my mind this was the strangest. Damn if the old guy didn't look at me—directly at me, into my eyes, or my soul, or whatever in me that is *me*—as if he understood exactly what was going on inside me. And then he touched me. He put a hand on my shoulder, squeezed a little, then patted me before letting go. His eyes were full of understanding. And, though I didn't understand why at that moment, pity. Which finally did scare me, a little.

"Sorry," he said. "You have to understand, I can't tell you too much; you could do things with that knowledge that . . . and the worst thing is, you'd do them from the best of intentions. That's—part of what makes this so hard.

"But you've got to know some. Enough to get by. So I'm going to tell you. But—and no shitting me here, you have to promise this and keep your promise like you've never done before in your life. I mean, even though you're still a kid. Because this is serious stuff. You can't tell nobody about this. Nobody. Understand? No one else can ever know."

He went on and on about how important it was to keep my mouth shut, but it wasn't necessary because I'd already decided that. And not because people would think I was crazy, because I'm smart enough to know that if you know the future you can prove it; you can bet who's going to win the World Series and things. But I'm also smart enough to know why you shouldn't. If people really are go-

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ing to go to the stars, I'm sure as hell not going to mess it up.

I guess my sincerity showed through too, because finally he stopped and nodded his head. "OK. This is—what? The late 1950s, right? Let's start off by telling you that there'll be men on the Moon in a little over ten years."

Ten years? I nearly gagged in disbelief. For Christ's sakes . . .

But my reaction didn't phase him at all. "That's right, ten years. The next president of the United States will whip up public enthusiasm for a crash program, and we'll do it just like he'll say we will. Well, more or less the way he says; nothing works exactly as planned. But we'll do it, almost right on schedule, just like he said. Says."

He stopped for a moment and let me work on that. I gazed out again, into space, at that world which looked so close and yet so impossibly distant at the same time. I felt like a baby just learning how to walk being told he was about to leap across the Grand Canyon. I mean, the Moon . . . just the thought still makes me dizzy. "Wow."

He gave me that *look* again and nodded. "Knew you'd like hearing that part." Then his face got sober, and I mean real sober. Scary sober. "Now the part you won't like. You see, you won't care very much. Because while all this is happening you're going to be hiding in a jungle halfway around the world, trying not to get your brains blown out." He let me work on that too, and for a while longer this time. "Oh, you'll survive. Some of your buddies—guys you'll really care about, like they were your brothers—won't, but you will. And that will mess with your head for a long time, because you'll wonder why they died and you didn't; but like I said, that's just dumb stuff. I told you, we're going to the stars, and that's the thing you want to keep in mind, always, no matter what happens."

Again that look, just like before, only this time he kept his hands to himself. A sort of weird half grin rose on his face; not a grin of amusement, but of something else—irony, I think they call it. "You're probably wondering why I'm telling you this," he said. "Part is because you told me I would, of course. But that's not the real reason."

"It isn't?" I tried not to tremble when I asked that, but the shivering came through despite me. I mean, Jesus, what he just told me. . . .

"No." He started to explain, then thought some. "You see, being through war isn't the worst thing that's going to happen to you. I said we'll go to go to the Moon. But then we'll stop. I mean dead, complete stop. No more lunar missions. No pushing on to other planets, building space colonies, or any of the things people thought we'd do. Nothing. Oh, we'll still have manned space missions, but they'll all be routine stuff; the only missions to other planets will be unmanned probes. And the politicians will cut back on the space budget more and more every year. And worst of all, people will do absolutely nothing to stop it.

"All of which is going to be unbearable to you. See, you may not know it yet, boy—excuse me, grandfather—

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but you've got the soul of a dreamer in you. I knew that growing up and listening to your stories about Apollo—" he bit his lip, as though he'd said something he knew he shouldn't "—and those heady days of men first getting their feet off this planet and all that. The way your face would light up when you talked about it. But even if I hadn't, I could tell it now just looking at you. It's in your eyes. The way you seem to see beyond whatever mundane things are in front of you at the moment.

"That's why the end of the Moon missions is going to be so hard. You'll barely be back from Nam—that's what you'll call the place where the war will be—when not only will you realize that all that fighting for your country was just a sham, but that your country was throwing away its future too. That your buddies died for nothing. That's when, when . . . when . . . there's no nice way to put it: that's when you'll crack up. End up in a hospital. On dope and suicidal."

He looked all apologetic, which more than anything else told me he was telling the truth. Which made me start to cry, at least on the inside. . . .

"Sorry to be telling you these things," he said. "But they're going to happen whether I tell you or not, so you might as well know. Besides, and now you've got to understand, this is the real point of my being here: believe me, I wouldn't take the chance, screwing with history like this if it weren't so important.

"See, you survive that too. Because, at least I believe, you did know. Because I had come back and told you that all this was going to happen. And that it was going to be all right; everything is going to work out in the end."

But it was too late. "All right? All right?" I tell you, I've never raised my voice at an adult before, and I hope to God I never do it again because it feels so awful, but I was screaming at the old man with all my strength. And didn't care. "*God damn you!* How the hell can you come here and tell me all this, and then say it's all right? It's not all right! It's the God damned lousiest thing I've ever heard in my life! Jesus Christ, I wish I were dead right now! I wish . . ."

It was my chance to go on and on, and I really let him have it, with all the cursing I could think of between the tears that were rolling out of my eyes; until I was just bawling incoherently, to nobody and everybody in particular and the hell with everyone and everything but mostly I just wanted to kill the old bastard, even if he really was my grandson. *Shit. Fuck.*

And here's the—OK, the second strangest thing. He just sat there and took it. Try to imagine what would happen if you went at an adult that way, but that's not what happened at all. He wasn't even mad. No, it was weirder than that: he actually seemed scared, as though he were the kid being bawled out and me the adult. He even looked on the verge of crying himself.

Which was good, because it calmed me down and let me think: we're going to the stars, remember? And that gave him the chance to pull himself together and tell me the rest. "Jump ahead about twenty years from the

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end of Apoll—the Moon missions. People start talking about going to other worlds again; this time, Mars. Problem is, it sounds hopeless: a bunch of experts get together and calculate it will take a few hundred billion dollars. All of which nobody, not even space enthusiasts, wants to do.

"But then along comes this guy by the name of Bob Zubrin, who shows how it can all be done at about the tenth of that price. And, well, never mind all the details—like I said, nothing ever works exactly as planned—but eventually we do it. And by we, I mean all humanity; not just America, but the Russians—that's right, believe it or not—the French, the Chinese, the Japanese, the . . . I can't remember all of them, but those were the major players, plus a host of others. We got to Mars and set up a permanent station, then a real colony, then . . . then the whole thing just took off. Back to the Moon, the asteroids, then the outer planets . . ." He sighed wistfully. "Damn, I wish I could tell you everything. Especially as—"

He stopped there, quite suddenly. But it was too late; I knew why. "Especially as I won't be around to see it, you mean," I finished it for him.

He fought for a few seconds before conceding with a nod. "Yeah. But you'll see enough. That's why I'm here telling you. You've got to get through the hard times, and you won't if you don't know. Besides, you don't have to see it to know it'll happen. It's like, I won't see us get to the stars, but I know it will happen; which got me through *my* hard times."

There was that twinkle in his eye again when he said that. And this time, when he looked up at the sky, it was not at the Moon or Jupiter, but someplace else; someplace I couldn't exactly make out because if there were any stars there, they were too dim for me to see.

I knew he was inviting the question; hell, daring me to ask it. "How do you know?"

The answer was so obvious I should have guessed it. He pulled out the device, and cradled it in his hands. "What do you think I do with this thing when I get back? Toss it out?" He shook his head. "You see, *my* grandchild is going to be on that first starship. Your great-great-granddaughter. And I know she's going to make it because when I was your age I had a visit like the one you're having now. And let me tell you, if you think what I've said is pretty incredible . . . *that* I wish I could tell you. But she told me I couldn't, because of what she said *her* granddaughter told her.

"But I've already said more than I should." He struggled to his feet, in that slow, deliberate way older people have, not like it's so hard but like they have to do it just right, and brushed the sand off his trousers methodically. "It's time I should be getting back." He put a hand out when I leapt to my feet to protest. "It's been a pleasure meeting you, grandfather. Especially from such a different perspective than the one I remember."

"But—"

—Was as far as I got. He took a few steps back, touched the device, and faded into nothingness just the same way he'd appeared, leaving me in my

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dark solitude. I started to shout something, as though my voice could carry across the years, but caught the stupidity of that in time. He was gone. I'd never see him again, until . . . well, until I was old and he the child with so much future ahead of him. If, that is, I believed any of what happened this night.

I stood there for a while longer, trying to take it all in, to make sense of what I'd just experienced. I finally decided that the only explanation that made any sense was that I'd fallen asleep out here on the dunes and dreamt the whole thing. But I didn't believe that for one moment, of course; how the hell could I have. . . ?

Doesn't matter, though. I mean, in a few years I'll know the truth, but standing there, gazing at those distant worlds and what lay beyond them, I realized that none of what had just happened had to be true to mean something. You see, even if it is just a dream, it's a dream I can live by. And sometimes, that's all a person needs to keep going. Even for a kid.

Especially when the dream is real. ■

New Moon

The moon is a Buckyball
filled with myth and lore,
The alchemy of pentagons
opens a superconducting door,
A transmutation hex
on carbon-60, -70, or more,
Waxing, waning, or fullerene
it's Nobel to the core.

—Carolyn Clink

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THE KRASNIKOV TUBE: A SUBWAY TO THE STARS

Approximately a year ago I wrote a column about the Alcubierre Warp Drive (see the 11/96 issue of *Analog*). The Alcubierre Warp Drive is a distortion of space, a solution to the equations of general relativity that forms a sphere of flat space surrounded by a warped-space "bubble." At the front edge of the bubble, space is contracting (like a collapsing black hole), and at the rear edge space is expanding like a mini-Big Bang. This space warp transports the contents of the spherical volume forward at velocities that can be much larger than the velocity of light. This was proposed in 1994 by Miguel Alcubierre in the physics journal *Classical and Quantum Gravity*.

It has taken quite a while for the physics community to digest Alcubierre's ingenious space warp, criticize it, and suggest improvements, but now this is beginning to happen. In this column I want to discuss some of this recent work.

S.V. Krasnikov is a theoretical physicist at the Central Astronomical Observatory at Pulkovo in St. Petersburg, Russia. He has examined Alcubierre's proposal and found what seems to be a near-fatal flaw in the scheme: if the space warp moves faster than the velocity of light, it cannot be controlled from inside. Krasnikov's analysis shows that at superluminal speeds the interior of the bubble is causally isolated from its surface and exterior. Photons cannot pass from the inside to the outside. Therefore, there would be no way of controlling the space warp, of stopping, starting, or steering. And it would not be a very interesting trip because passengers inside the bubble would be isolated from the outside world and unable to see where they were going.

Of course, these problems might be circumvented by entering and exiting an Alcubierre space warp while it was traveling slowly, arranging for some automatic mechanism to raise the bubble velocity above the speed of light for a programmed period, and then lower the speed again in order to exit. This scheme is unworkable because material objects (like control computers and warp generators) in the skin of the bubble would be de-

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stroyed by the enormous forces generated from space annihilation or creation, while outside the bubble they would not travel at the superluminal speed of the interior and would be left behind.

Therefore, Krasnikov proposes an alternative: create a space warp behind the spaceship as it travels at near lightspeed to some distant star system, and then use the "tube" thus created for the return trip. He suggests a particular "metric," a distortion of space that has an interesting property for the return trip: it gets you back home shortly after you left, no matter how far you go. Perhaps this is best illustrated with an example.

Suppose we have a starship that can travel at speeds that are 0.00005% (5 parts in 10,000,000) less than the speed of light (about the speed of particles in our largest particle accelerators), which means that within the ship time slows down by a factor of 1,000 (the clock ticks that much slower than a clock on Earth.)

The ship makes a trip to the star system of Deneb, the brightest star in the constellation Cygnus, approximately 1,630 light-years from Earth. For Earth-based observers watching the trip through a telescope, the trip would take essentially 1,630 years. However, because of relativistic time dilation the trip only takes 1.63 years for those aboard the ship.

But as SF readers understand, the short duration of the trip is only a relativistic illusion, the lightspeed equivalent of sleeping in a deep freeze while time goes on outside. We know from stories like Ursula LeGuin's *Rocannon's World* and Joe Haldeman's *The Forever War* that when the astronauts return from a trip to Deneb, they can expect to find that 3,260 years have passed, everyone they knew is dead, and the world has changed beyond recognition, right? Well, not quite. The Krasnikov Tube that was created in the wake of the spaceship now forms a return pathway within which time "unwinds." Because of the temporal properties of the Krasnikov metric, if the ship travels home at near lightspeed in the space enclosed by this tube, the astronauts can return home just a bit over three years after they left.

In effect the Krasnikov Tube is a tunnel through time, connecting the departure time of the ship with the time of its arrival at Deneb. Inside the tube space-time is "flat," i.e., unwarped, but the path limits of light through space-time has been opened out so that it permits superluminal travel in one direction only, e.g., back to the starting point on Earth.

In its impact on interstellar travel, the Krasnikov Tube is similar to that of a hypothetical wormhole mouth launched with an near-lightspeed velocity, a concept that I described in a previous AV column ("Wormholes II: Getting There in No Time," *Analog*, June 1990). In both cases the distortion of space-time provides a shortcut that subverts the relativistic rules of interstellar travel. However, there is an important difference: the traveling wormhole provides a shortcut through time *and* space, so that once the wormhole path was established one could literally walk from one star

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system to another. On the other hand, the Krasnikov Tube is only a shortcut through time. The distance to Deneb and back must still be traversed by a fast starship with enormous relativistic time dilation.

Krasnikov argues that despite the time-machine-like aspects of his metric, it cannot violate the Law of Causality (that a cause must always precede its effects in all coordinate systems and along all space-time paths) because all points along the round-trip path of the spaceship always have an ordered timelike separation interval [in algebraic terms, $c_2(t_1-t_2)^2$ is always larger than $(x_1-x_2)^2 + (y_1-y_2)^2 + (z_1-z_2)^2$]. This means, for example, that a light-beam message sent along a Krasnikov Tube cannot be used for back-in-time signaling.

Therefore, aside from the "engineering problem" of actually building a hyperfast starship that can leave a Krasnikov Tube in its wake, this all sounds very promising as a way around the lightspeed limit. What, then, are the problems, if any, with Krasnikov's proposal for fast-turnaround interstellar travel?

Allen E. Everett and Thomas A. Roman of Tufts University have recently written a paper criticizing the Krasnikov scheme on several grounds. First, they show that while one Krasnikov Tube presents no problems with Causality, two Krasnikov Tubes going in opposite directions can create timelike loops and violations of Causality.

For example, suppose that on the return trip from Deneb to Earth the astronauts lay down Tube II rather than traveling back in Tube I, the first tube they produced. In about 1.63 years of ship time they will arrive back on Earth, but at a time 3,260 years in the future of their departure. But now that two Krasnikov Tubes are in place, astronauts from the future can travel to Deneb in Tube II, then to Earth in Tube I and will arrive 3,260 years earlier than their departure. The Krasnikov Tube system has become a time machine.

In a previous column (*Analog*, Mid-December 1994, "NASA Goes FTL—Part 1: Wormhole Physics") I had discussed the emerging view first advocated by Stephen Hawking that "Nature abhors a time machine," and that exponentially growing vacuum fluctuation will rise up and destroy any attempt to create a timelike loop in which Causality is violated. If that were so, it would be possible to construct Tube I, but vacuum fluctuations would destroy Tube II before it could be used. Therefore, as long as Krasnikov Tube were used for "proper" activities like interstellar travel and not for "improper" activities like time travel, all would be right with the universe.

Everett and Roman further demonstrate another problem with the Krasnikov Tube: it has a net energy that is *negative*. They also argue that within the thin walls of the tube the local energy density is not only negative but also is so enormous as to be physically impossible to achieve with any conceivable machine constructed of matter.

Producing a region of space with a negative net energy would actually offer some advantages, in that you could use the surplus energy you remove to

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drive your spaceship or perhaps beam it back to Earth to be sold to the light and power company. However, while we currently know how to use the Casimir effect to produce a small region of space that has a small negative energy density, the total overall energy of any Casimir device is positive. Creating large regions of space that have a negative energy density is well beyond our present technological abilities.

The issue, however, is not whether *we* can construct a Krasnikov Tube (we certainly can't), but whether it is physically possible for some advanced civilization, one that can carry out works of engineering on the scale of star systems and user-friendly spacetime metrics. Typically, the interesting but exotic solutions to Einstein's equations of general relativity such as wormholes, warp drives, and the Krasnikov Tube considered here all require some negative energy density and violate what is called "the weak energy condition" (that the overall energy of a metric should be positive). This is a rule often used in general relativity. It may or may not have the status of a natural law. I feel, with some encouragement from considerations of quantum gravity, that the weak energy condition is not a law of nature and can be violated.

In a previous column (*Analog*, Mid-December 1994) I described Visser wormholes which are connected regions of flat space framed by an exotic metric of general relativity called a cosmic string, a one-dimensional stringlike discontinuity in the structure of space. The comic string framing a Visser wormhole must have negative energy and negative string tension, giving it a tendency to expand that balances the wormhole's tendency to contract and disappear. This seems to be a general property of exotic metrics. They would otherwise be unstable, attempting to pinch together and vanish. The negative energy component in general represents a tendency to expand, thus counteracting the intrinsic tendency of the metric to collapse.

The two-dimensional analog of the cosmic string solution of general relativity is the "cosmic wall," a two-dimensional sheet discontinuity in space. If we imagine this cosmic wall formed into a circular tube and having a negative "hoop tension" around its circular cross section, then we have a suitable wall for a Krasnikov Tube, concentrated negative energy density and all. Whether this works on closer scrutiny I will leave to the mathematical theorists, but it is at least a plausible way in which an advanced civilization might build such a tube.

This, then, raises an interesting question. Are there such Krasnikov Tubes connecting star systems in our part of the Galaxy? How could they be detected at interstellar distances? Would they have any distinctive physical properties (like deflection of light passing near or through them) that would constitute a unique detection signature?

At least, the existence of Krasnikov Tubes between the stars might provide a neat solution to the Fermi Paradox. We get no interstellar visitors because there is no Krasnikov Tube coming to the Solar System, so it's too

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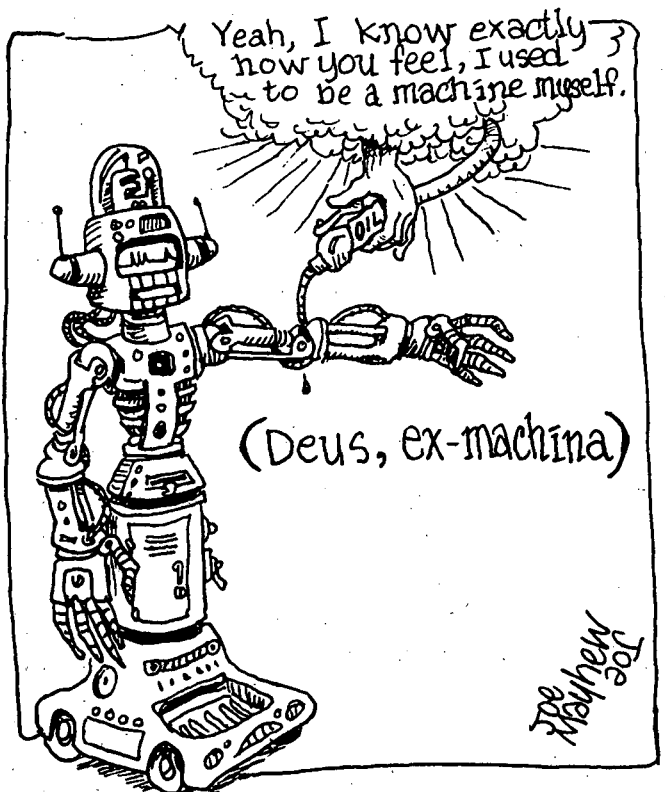
inconvenient. We receive no interstellar communications because all such communications are beamed through Krasnikov Tubes, so that the sender does not have to wait years or centuries for an answer.

I think that, at the very least, we have some good material for hard SF stories here.

AV Columns On-line: Electronic versions of eighty-four or so past "The Alternate View" columns from *Analog* by John G. Cramer are available on-line on WorldWideWeb at the URL: http://www.npl.washington.edu/av. The LANL preprints referenced below can obtained on WorldWideWeb at: http://xxx.lanl.gov ■

References:

The Krasnikov Tube: S. V. Krasnikov, LANL Preprint Archive gr-qc/9511068 (1995); Allen E. Everett and Thomas A. Roman, LANL Preprint Archive gr-qc/9702049 (1997).



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Left to right: Tina Lee, Stanley Schmidt, Bud Sparhawk, Bud Webster, George H. Krauter, Fran Danon.

The Analytical Laboratory awards breakfast was held April 19, 1997, at the Crowne Plaza in Kansas City, MO, during the Nebula Awards weekend. We were delighted that so many of our winners were able to join us on this auspicious occasion! Bud Sparhawk, whose story "Primrose and Thorn" won for best novella; and Bud Webster, first-place winner for his novelette "The Three Labors of Bubba"; along with artist George H. Krauter, who had the winning cover for his May illustration of "Primrose and Thorn," all partook of the festivities. Missing from our table was Ian Randal Strock, who won for best short story with "Living It Is the Best Revenge," and best fact article with "The Coming of the Money Card: Boon or Bane?"

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Marc Stiegler

VARIATIONS IN DREAMPAINT

Odd coincidences may reflect connections— but not necessarily simple ones!

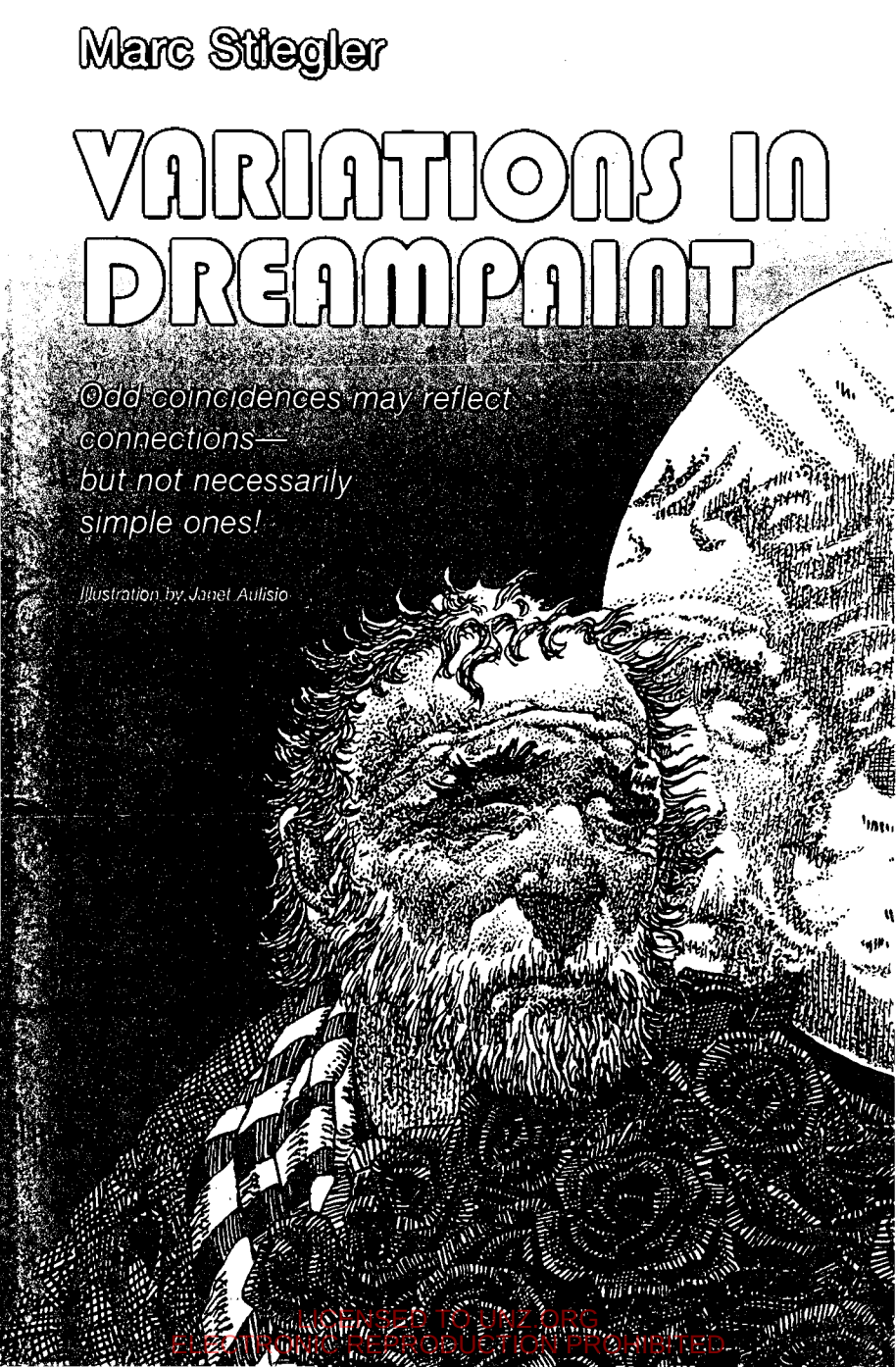

Illustration by Janet Aulisio

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I wiped the perspiration from my forehead again, scratched my beard, and stood patiently at my little flower stand. I watched the crowd, seeing if anyone recognized me . . . seeing if I could find him. I was not worried that I wouldn't recognize him; I knew him too well to miss him, though we had never met. I had never even seen his photo.

I was more worried that someone in the crowd would recognize me. It had happened once, ten years before, despite my garish clothing, and the DreamPaint 1010HR sunglasses I wore. Occasional recognition was inevitable, if your face had appeared on every magazine cover from *Time* to *Byte* to *Forbes*; if you were the only man to be compared to both Bill Gates and Michael Milken in the same breath. Fortunately, being the wealthiest man alive not only made me recognizable, but it also made correcting the problem straightforward: the lucky lady who'd spotted me ten years earlier now inhabited the only Swiss chalet on the Great Barrier Reef, and she did not want to lose it.

It was 11:45 A.M. I couldn't tell if today was the day that my nineteen-year ritual would end. Part of me hoped it would; part of me, a dark part, hoped it would not.

As usual, as I stood sweating at my flower stand, I daydreamed of the joyful way the tragedy had begun, the moment when my wealth, and my flower stand, became inevitable parts of a future history I would have to write, alone.

I bent low, so I could get my head down to the open car window. "Thanks, Chris, see you in the conference," I said, and waved her on so she could catch a parking spot close by, rather than farther away from Moscone Center.

"Sure, Eric. Get done with these guys soon, so you can get in on the real action, OK?" Chris said before shifting the car back into gear.

"Wait!" I said with the urgent sincerity I had practiced faking for years. I reached behind her ear. "Got it," I said, handing her the pink rose I seemingly pulled from behind her ear.

Chris just rolled her eyes. "Don't you ever tire of silly magic tricks? Couldn't you at least learn a new one?" She started to pull away, and stopped one last time. "By the way, we're having a special midnight bull session tomorrow night."

"Goodness. The Virtuality Con is having a special bull session tomorrow night, too. At 11 P.M."

"Well, Eric, that's cool, but you better leave their party at midnight and come to ours. Everybody who's anybody will be there. Including someone you've wanted to meet. Someone very special." Her eyes laughed at me.

As she left, I straightened up to my full height—at 6' 7", that meant a lot of straightening, and I was used to people staring at me as I did it.

I'd been a starter on the Stanford basketball team for one semester. But then one Saturday night a drunk driver veered into my lane, and I didn't dodge fast enough. Shea, my girlfriend, never came out of her coma. I was lucky, only getting my right knee banged up. Permanently.

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I grieved for Shea, but it was the knee that ruined me. My whole future, my whole purpose—to play in the NBA—was wiped out. I was getting good grades in school, but I was empty.

I don't know what would have happened to me if it hadn't been for the guy on the white mountain bike. He was the VP of some company in Palo Alto, and he rode his bike to work from his home in Redwood City every day, cutting across the Stanford campus. Anyway, he stopped next to me one day while I was admiring the palm trees by the campus center; he wanted to admire them too. We started talking, pretty uneasily at first: we were very different kinds of people, the jock and the nerd. But he told me about the work he was doing, and he told me about virtual reality—not the weirdo stories typical in the news, but explaining its underlying value, why it would make the world a better place. Eventually he told me about nanotechnology, too. And he got me hooked.

I never would have guessed I could fit in with the nerds and the hackers, but looking back now I guess I was always a nerd at heart. I switched from not having a major to chemistry. I took up virtual world construction as a hobby, and the development of molecular tips for Scanning Tunneling Microscopes as a plan for a career.

Which left me in a quandary the year the Foresight Institute put on the Nanotechnology Conference in the Moscone Center North on the same weekend that the VRML Standards Committee put on the Virtuality Conference in Moscone South. Unable to decide which to attend, I tried to attend both. That was how I'd wound up being dropped off at the Virtuality Conference by Chris O'Keefe, who was organizing the Nanotechnology Conference.

I walked into the building. The registration lines were to the right, but I already had my badge thanks to Linda Scharansky, another friend who was helping organize the VR con. I snapped it on and strolled over to the display of events, at the base of the stairs leading to the mezzanine.

Despite the staccato clatter of background noise in the hall, I heard a remarkably distinct sound: the sound of happy feet, dancing down the steps behind me. I couldn't help turning to see who projected such joy and laughter. I only caught a glimpse of her before she crashed into me.

She was too tall to be of faerie blood, too silly with her arms flying wildly to be a goddess, too surprised at being caught in my arms to be an angel. But as I lifted her bodily off the floor and put her carefully back down, she felt and looked like all three to me. My heart beat just a little faster. I hadn't really been involved with anyone since Shea, but . . .

I smiled at her, my most open, winning smile. She smiled back, a bit dazed. For a moment a huge warmth suffused her face, then disappeared. "Sorry," she said, "I'm not used to steps and staircases."

"So you're from Kansas, then, where everything's flat," I said, in a weak effort at a joke.

She laughed uncertainly. "No, actu-

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ally, I'm from Berkeley," she replied. She stared at me for a moment, so analytically it stopped my next foolish response dead in my mouth. She continued, "You wouldn't believe how much you look like my boyfriend."

Suddenly all my thoughts of love, romance, and sex, not necessarily in that order, were smashed. "Does your boyfriend play basketball?" I asked.

She looked away. "Gary's dead," she explained. She smiled half-heartedly. "Besides, they don't play basketball anymore."

No basketball in Berkeley? I should have questioned it—but the thought suffocated beneath the wave of new hope that thrilled me, since she was unattached. Sure, it was a shame her boyfriend had died; I guess I would have preferred he was OK for her sake, but it did mean I had a chance.

"I'm sorry," I said, with reasonable sincerity.

"It's OK. It's not your fault. At least, it's probably not very much your fault," she finished rather mysteriously. "What's your name?" she asked rather pointedly.

"Eric, Eric Rinaldi," I said.

Her face fell, like she had expected me to be someone famous, then brightened like I had passed a test. "I'm Karly. Nice to meet you, Eric. Sorry I ran you down. Gotta motor," she finished.

It was now or never. "Karly, wait!" I cried. "You have to let me buy you dinner. Meet me right here, at 6 P.M."

She paused in lonely reflection. In the end, my resemblance to her beau probably made the difference. "OK." She turned to leave again.

"One last thing," I said rapidly. "This is a stupid question, but I have to ask. Are those VR glasses you've got there?" I pointed at the sunglasses she had propped on her forehead, glasses that were just a little *too* thick, glasses I thought I saw lit up on the inside when she first turned away.

She stared at me again, then grabbed the glasses off her forehead and jammed them into her pocket—but not before I caught a glimpse of the inner side of the lens. I stood in shock as she muttered, "I knew I shouldn't have brought them." She bounced away, unable to conceal her inner buoyancy despite her obvious irritation.

I just stood there a moment, savoring her passage . . . and savoring, of all strange things, the glimpse I'd had of her glasses. The resolution, just from what I'd seen in that moment, was beyond anything I'd ever seen or heard of. And I'd never heard of the manufacturer, either—the label on the inner edge of the left earpiece said, "DreamPaint 2020EHR." Either she was wandering around the con with the most remarkable innovation of the decade, or . . . or I didn't know what.

I checked out the events and seminar schedule for Virtuality. It was going to be a great gathering, with all the glitterati of the field: Will Jaeger, Lisa Strang, and Paul Greenfield were all scheduled to attend.

Next I trotted across the street to try to catch up with Chris. There was a rumor that Dr. Drexler would show up at this year's convention, and I really wanted to meet the founder of the field, though I had nothing particularly clever to say to him. The presi-

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dent of NTools was going to be there as well, and the fourteen-year-old genius from MIT, Austin Zerr, was on the schedule for the third day. Rumor had it that Austin had met half the requirements to win the Feynman Prize in Nanotechnology, an awesome development if it were true.

I was scanning the crowd for Chris when I saw her for the second time—Karly!

She was turned partly away from me, scanning the crowd much as I was.

Truth be told, I almost didn't recognize her, she had changed so much. Minutes ago she had been the living incarnation of a fireworks display; now she was subdued, in a dark gray jumpsuit with sky blue stripes that enhanced her athletic build. And her hair—I would have sworn it had been longer. She must have pulled it up in some fiendishly clever female way . . . and all in a matter of seconds!

A more thoughtful person would have asked himself if this might be Karly's sister, but I did not. I catstepped up behind her. As I was about to shout "Surprise!" in her ear, however, she spun on me in some kind of combat stance. In a cool voice she asked, "Who on Earth are you?"

"Eric," I replied with foolish surprise. At last my brain caught up with reality: "You're not Karly, are you?"

A smile touched her lips. "I'm Cory." She shrugged. "At least, I think that's how it would translate."

I just stared at her, unable to believe my eyes. "I don't suppose you have a sister named Karly?"

She shook her head; so much for the simple explanation. She returned my stare. She broke the silence first. "You . . . look remarkably like my boyfriend," she admitted at last. She reached out, took my hand in hers; her touch was as cool as her expression, though she seemed to be warming up.

"Your hands are large and strong, just like his."

I took a deep breath; this was going to be a very strange bit of déjà vu. "But Gary just died, didn't he?"

Tears welled in her eyes. "He was getting into his car at the intersection of Telegraph and Durant, and . . ." The tears cleared away; she stared at me in amazement. "How did you know?" she demanded.

Was this a bad dream, or the beginning of an adolescent fantasy, with two stunning women—twins, they *had* to be twins—coming into my life at the same time? For the moment, I decided to play along with whatever the Fates had concocted for me.

"Cory. Meet me here, tonight, at 11 P.M. I will then tell you all about yourself." Ha! I was now able to treat Her as mysteriously as They had treated me. I gave Cory my brightest smile.

Impishly, she smiled right back, and suddenly her inner radiance broke through, and she owned me, just as surely as Karly had owned me just minutes before.

So where do you take a hot first date in San Francisco? There are many answers, of course, lots of places you could go, all depending on your hot date and your intentions. My intentions were all a bit outside the usual

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motivations. One goal was to determine if Karly knew more about her twin Cory than Cory knew about her. Another was to test my own best theory about the twins, both of whom had lost boyfriends named Gary recently. My theory was simple: one girl with two personalities equaled a beautiful woman who needed great psychotherapy more than she needed any kind of boyfriend.

Last but not least, whereas other guys on other dates might care about other articles of clothing, one of my goals was to get into Karly's glasses. I couldn't get my mind off those DreamPaint 2020s.

In the end, I took her to the dining room atop the Marriott. It was close to Moscone, and there was no better view in the city—at least to the south. It was also fun to tell her I was taking her to the Wurlitzer Building—so nicknamed because it looked like a giant pipe organ, dozens of stories tall.

I guess I shouldn't have been surprised when she didn't have a clue when I described the Wurlitzer—she muttered about how she didn't get across the Bay Bridge very often. I confess it was fun taking her there for the first time. I was not surprised that she stepped right up to the window and looked straight down: most people don't, the window is full-length, with nothing between your toes and a long spiraling plunge except an inch or two of pure transparency. It's sort of like a glass bottom boat twenty stories in the sky. I'd always loved it myself, an E-ticket ride, even if I did feel just a bit dizzy when I stepped back with my palms ever so slightly cold and damp.

She laughed at me. "You've got a compensatory personality," she accused me, "If you're not good at something, or you're afraid, you have to prove yourself by being better at it than anybody."

"And what are you?" I asked, laughing in turn.

She quirked the corner of her lip. "I've got a crusading personality," she said.

I had a rush of inspiration. "You're here to avenge Gary's death," I guessed.

Her eyes widened, a cat caught in headlights. She replied haltingly, "More like an effort to prevent deaths like his from happening again." A spirited light came into her smile, "And, of course, it would be better still if I could bring Gary back to life."

I wanted off the subject of Gary, but couldn't help one last show of compassion. "If I could bring him back, I would," I said with conviction. Before she could respond, I reached behind her ear and pulled out a red rose. This time her eyes widened with childish delight. My smile was a little bit forced; I had not only pulled out the flower, but also tapped the back of her ear with a dot of indelible black ink, completing Phase I of my plan to tell if Karly were crazy: Phase II would occur when I met Cory later. If Cory had the same dot, I would know who she was.

Of course, if Cory did not have that dot, I would be *really* stumped.

The magic flower set the stage for a truly wonderful dinner; we didn't even get to dessert before I'd invited

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her to accompany me to the private soirée of the great minds of VR, the following night at 11 P.M. As I listed the people who'd be there, her eyes grew wide. "All in one place at one time!" she exclaimed like a little girl.

"In the flesh!" Technically it wasn't my place to invite anyone to this shindig, but, hey, my mouth was following where my heart led. Right now, there was nothing in the world I'd deny to my heartbreaking mystery girl.

Dinner ended too swiftly, and the lights of the city beckoned. By the time we reached Moscone Park we were walking hand in hand, laughing.

Karly pointed at the white structure we were passing. "What's that?" she asked.

"That's an amphitheater," I said, a bit puzzled that she hadn't a clue. I laughed, "It is the finest singing stage on Earth." I jumped up on the stage. I began to sing. It was not one of my greater talents.

"Stop! Stop!" she implored.

"If you don't want me to sing, then I want to hear *you* sing." I smiled wickedly: a key element in good blackmail is good humor.

Underneath her reluctance I could see a glimmer of acceptance. I continued, more softly yet more commanding, "Come on, now."

She frowned, but ascended to the stage nonetheless. She waved her hands at me. "Shoo," she said.

I stepped down. She began to sing. And I stood transfixed by the beauty and power of her voice.

I am sure my reaction was not strictly the result of my personal bias toward her; I still remember that a small child, four or five years old, curly blonde hair and innocent blue eyes, was drawn to the stage to listen with me. At first I thought the little girl was an apparition called into existence by the singing, just a natural element of the song itself. But when her parents joined us a minute later, they too shared the entrancement.

Karly sang of unalloyed joy, spots of bright sunshine reflected from raindrops, but with no need for raindrops to carry them; or perhaps there *were* raindrops, for when she finished, I had to wipe my hand across my face to dry them off.

"Beyond imagining," I said.

She laughed, jumping lightly off the podium to join me. "You've heard it before, I'm sure," she said.

"Never—whose work was that?"

"Stuart Glennan." She looked puzzled. "You haven't heard of the most famous songwriter in the world?" Her expression changed, as she came to some internal realization. "Uh, I guess I'm not surprised. He's really only famous where I come from."

"He certainly deserves to be famous," I said. "Why hasn't he published on the Web?"

"He has . . . or I guess I should say, he will," she concluded. "I guess he hasn't gotten around to it yet."

"He sure as hell ought to!" I couldn't believe such beautiful music hadn't been published yet! "Listen. Let's chat him up—why don't you come on down to my place, we'll log on, and find him and get him publishing! He deserves a larger audience!"

The more I talked, the more unhap-

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py she became. She was slowly backing away from me; I realized she was already out of reach of my long arms.

"Gotta go," she said in a small voice.

"Wait," I cried, to no avail. She was running silently across the path, her hair streaming out in moonlit splendor behind her.

I started after her; I could have caught her, even with my bum knee, I'm sure. But she did not want me, and that ended the race before it had begun.

Slumping as I watched her disappear into the darkness, I suddenly realized how late it was. Cory! I straightened up with an electric rush. Was that why Karly had run off? Because her alternate personality had kicked in and told her she needed to change costumes for her next meeting? I trotted around the side of Moscone North; from the crest of the hill I could see the entrance to Moscone South where I was to meet Cory, and at the same time I could watch to see if she came from the same direction in which Karly had disappeared. I guess I was a bit too sure that she'd come that way, because I was looking at the Wurlitzer building when the word "Boo!" suddenly whispered in my ear. Cory's warm breath tickled my ear.

I didn't *quite* jump out of my skin. "How'd you do that?" I asked as I turned to her.

She was a different person from the grim Cory I'd met earlier. Oh, she wasn't transformed into Karly, but she had Karly's radiance; she was bubbling over with joy. "It's wonderful here," she said, twirling around with her arms thrown wide. "It's so free!"

"Unlike Berkeley," I replied dryly.

Her arms fell. "Well, that's not exactly what I meant."

"It's OK." I didn't know what was OK, but she suddenly needed consoling. I put my arms around her, pulling her close. Now my breath was as warm on her neck as hers was on mine. I was relishing the moment till I noticed a little detail, barely discernible in the light from the street lamps—there was no black dot of ink on her neck. Cory and Karly really were different people. The good news: I wasn't falling head over heels for a multiple-personality escapee from a psycho ward. The bad news: I was falling for two different people.

People who happened to be twins but who didn't know each other. Twins who had both lost their tall boyfriends named Gary, in Berkeley, just recently. Gary must have been a brilliant two-timer, to keep these two on a string without finding out about each other.

Sure he was, and I had a flying saucer in Brooklyn left to me by an expired maiden aunt. I needed a better explanation. All I could come up with was that somehow, Karly had found and removed the (supposedly) indelible mark on her neck in the few minutes between leaving and returning; the mark she didn't even know she had when she left. Yeah, right.

Inspiration struck. "I have a favor to ask of you."

She smiled inquiringly.

I took her hand and guided her to the amphitheater. "Will you to sing for me? Your favorite song?"

"Well . . ." She looked very doubtful.

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"Please. I know you have a beautiful voice."

She closed her eyes. And a new melody unlike anything yet heard on earth filled the park.

Where Karly's song had been a burst of joy, this was a haunting work of despair, of lonely terror in the dark, of empty eternities . . . of missed opportunity. Her voice had an eerie, otherworldly quality, an almost inhuman tenor.

I cried again, as I had cried for Karly's song, but this time the tears were cold, carried by the chill midnight air.

When she had finished, I abruptly sat on the grass: my legs seemed unable to support me. She plopped down beside me then, and hugged me as I had hugged her. "It's all right," she said, "it's not going to happen. I promise," she said cryptically.

"Who wrote that?" I asked, still in a bit of a daze—although I already knew the answer. "Don't tell me Stuart Glennan wrote that one too."

Ha! This time I had amazed her. Her face filled with wonder. "How did you know?"

"Because your twin sister, or your clone, or whoever Karly is that she is a perfect replica of you, also has an incredible favorite song by the same guy."

Her voice fell. "Eric, I told you before, I don't have a sister, and I cannot possibly have a clone, either." She thought for a moment. "At least, I cannot possibly have a clone here, at this time."

For the next hour we didn't talk so much as I interrogated her. She never denied the clear implication that there was something very funny about her, never refuted my strange questions with the simple observation that I was strange myself. Clearly, her heart wanted me to figure it out, to understand her, to share her grief and pain. But her mind fought it, believing it too dangerous to trust anyone, even me, the smart nice guy who looked so much like the love she had lost.

"What do you think of the future of VR?" I asked.

"Silly stuff," she replied, a different answer that was yet symmetrical to an answer Karly had given me during dinner, when I had talked with her about nanotech: *"Nothing important will come of it,"* Karly had said. Now Cory cleared her throat and spoke of VR: "Nothing important will come of it." Cory's voice, like Karly's earlier, was full of confidence and scorn.

Unthinkingly, I posed another test to her. "Come with me, let's talk to Stuart Glennan on the Web."

"No! I have to leave now."

She broke away from me and disappeared into the night. And so, having scared off the two most remarkable women of my life in one night, I found myself alone again.

It was past 2 A.M. when I finally reached my apartment. I was exhausted, more tired than I had ever been even after working the washing machine assembly line as a summer job, putting the output hose on the pump on the baseplate 1,200 times every night.

But tired as I was, I could not sleep. I needed to find out about Stuart Glennan. And Gary.

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I started with Gary. It should have been easy to find him on the Web, there couldn't have been too many Garys who had died recently at the intersection of Telegraph and Durant. I searched the obituaries for all the local Berkeley and San Francisco news sites, and quickly came up with . . . nothing. Big zippo. No one by that name had died at that location in the history of the Web, much less in the past year. Could "Gary" have been a nickname? No, that didn't help either: no one by *any* name had died at that intersection in the last year. Another mystery. I was too tired to curse.

I struck pay dirt with Stuart Glennan, though there was a lot of regular dirt to shovel first. Over a dozen Stuart Glennans had postings out there. After beating the pages till I was blue, I found one, a professor of philosophy, specializing in hermeneutics, who dabbled with the occasional piece of music.

He happened to be on-line. I could hardly type coherently by this time, much less think a straight thought. But I couldn't stop, driven by my twin mysteries. What else could I do, except chat him up?

>>Sir, are you the author of a song with these words? My girlfriend just sang this dynamite song for me and told me you had written it.<< I typed in a passage from Karly's refrain.

The response was a bit more vehement than it should have been. >>How the Hell did you find that lyric! I just came up with that passage last week, and I haven't shown it to *anyone!* Not even *my* girlfriend.<<

That set me back. >>Are you sure? My girlfriend sang the whole song for me.<<

I could tell Stuart needed to get some sleep; he was losing it. >>What did your girlfriend do—come back in a time machine?<<

I chuckled. >>I suppose we shouldn't rule it out. I just met her today . . . or rather, yesterday, at this point.<< I thought about it for a moment. >>Would you, ah, like to hear the rest of the lyrics? Just so you can get the words right, so we don't accidentally screw up the future? :-) <<

That finally got a smile out of him. >>Thanks for the offer, but no thanks :-) I think I'll struggle along on my own.<<

>>OK, but please forgive me for pestering you one last time. What about this song?<< Now I sent him a bit of Cory's lyric; just typing it made me shudder with cold.

Another long pause ensued. At last he answered, >>I guess I shouldn't be surprised. That's another song I started but never finished. I . . . wasn't . . . sad enough . . . to finish it. Besides, it was unsingable. No one in the world has the range to sing it properly.<<

I shook my head. Unsingable? Cory had not only sung it, she had filled it with life! I went back in my mind over her performance. I tried to separate her voice from the music; so strong, so clear, such crisp, lilting highs . . . such hauntingly powerful lows. Yes, Stuart was right. No normal human voice could sing this song. Now I understood why the melody had such an eerie, otherworldly quality. The mystery of Cory was no longer even who she was, but what.

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By this time the Sun was coming up, and I was brain-dead. I fell into bed to sleep for a couple of hours before going back to the conferences for another day of mystery, beauty, and intense confusion.

Even before meeting the mysteries of Karly and Cory, I had always done my best thinking while asleep. For tough physics problems, where other people would bang their heads all night long, I would just knock off early, drifting off to sleep with the equations dancing lightly in my head. When I awoke, I didn't necessarily have the answer, but I usually had its scent.

As it was with physics, so it was with my twins. Understanding the twins would require the strictest application of my own personal favorite logic, a piece I liked to call Occam's Hammer: If there are two reasonable and simple explanations for a phenomenon, but each explanation conflicts with at least one fact, then a third explanation, much more complex, is required. Complex, counterintuitive explanations are the very stuff of quantum physics, and so my quantum physics courses had prepared me well for this situation.

I could theorize all I wanted to about split personalities, twins, and secret cloning technology, but there was only one place in spacetime where Karly and Cory could have learned songs that had yet to be written. I raced to Virtuality to confront Karly with my insights.

I spotted her coming out of a seminar on resolution illusions and eye focus tracking. She looked grim . . . and then she saw me. She transformed as I watched, as the grimness evaporated. I think I flushed as I realized just how much I personally had the power to change her mood.

She skipped up to me. I spoke first. "I need your help," I said. I retreated with her down the hall, looking for a quiet place. It was pretty hopeless: the marble floors and tiled walls made a giant acoustic lens, carrying garbled echoes to every nook in the place.

"What's up?" she asked.

"Investments," I explained. She looked puzzled. I continued. "What do you think of JouleView Corporation as a VR company to invest in?"

She gave me one of those "you've got to be joking" looks.

"I see. How 'bout VThink Inc.?"

Another stare.

"What about DreamPaint?" I asked, holding my breath.

She lit up. "Now *that's* a company to invest in."

"I see." I looked into her eyes. "Karly, DreamPaint hasn't even been founded yet."

Her chin quivered. "It's a secret," she said defiantly, "You just haven't heard of them!"

"Karly, anyone who could make the DreamPaint 2020 wouldn't keep it a secret. They'd IPO and become billionaires."

She just stared at me.

"Tell me about the future, Karly. Tell me why you came back."

She sobbed. I gathered her in my arms, to support her . . . and to make sure she didn't go anywhere. "You must tell me, Karly. Let me help you."

And so she told me, a rich tale of the

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future, a future in which DreamPaint exploded onto the scene, bringing totally immersive virtualities into every home and office. Oh, they weren't perfect at first, and the first DreamPaints cost too much to put in a box of Crackerjacks. But after the initial breakthrough, evolution was breathtaking, even faster than the takeoff of computing power in the heyday of the microcomputer revolution.

Not only did individuals depart into Virtuality—whole communities disappeared, for all intents and purposes, into full immersion worlds, worlds far more satisfying than any reality.

These immersive otherworlds left their people remarkably well positioned when the Millennial Depression wiped out the economy as we know it. Instead of raging at the politicians, the virtual communities ran millions of social experiments outside the reach of traditional power-seeking con artists. From the stew of alternatives they explored, they assembled a body of insights, and bound together in a small Webdoc: *The Principles of Self-Organizing Groups. The Principles* allowed the members of a group to build a civil society without government intervention.

Self-organization swept the impoverished planet, trampling traditional governments and their hugely expensive bureaucracies. Soon wealth started growing again, ever faster till it reached a staggering pace. Wealth led to innovation, and in this context, the quality of immersive virtuality leapt ahead—and this time everyone participated.

But then it started to fall apart. Fewer and fewer people left their idyllic virtualities to foray back into reality, and the society still needed people to tend the machines. The decay became visible first in the life-sustaining but tricky high-tech arenas. Jet aircraft became too dangerous to fly. Hospitals became unable to perform delicate surgical procedures. Eventually, even cars failed—and there was no one willing to repair them.

Karly and Gary had been crusaders of a sort, trying to get their communities back into the fresh, real air. And that was when tragedy struck. "I guess . . . I guess I should show you what happened," she said. Reluctantly, she pulled her glasses out of her hair and handed them to me.

I held the DreamPaints half-reverently for a moment, then slipped them on.

My whole body *blinked,* and suddenly I was standing at the corner of Telegraph and Durant: I recognized the Durant entrance to the little indoor mall that ran parallel to Telegraph. I could feel the warmth of the sunshine on my forehead; it must have been just after noon, the Sun rode high in the sky. A gentle breeze laced through the hairs on my arms. I could just barely hear someone talking behind me, about how nice it was considering it was already July 10. The sounds and sensations almost frightened me, because I knew that in reality I was standing in a dark, cool hallway, wearing a long-sleeve shirt, a long way from July. But after a moment I learned how to switch focus: just as I could look through the glasses to see the hallway, I could feel through the sensations to know where I was. Feeling in control

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at last, I switched focus back to the scene in Berkeley.

A tall man striding down the hill caught my eye. His back was to me, but I knew who he had to be, because he was so tall, and his hands were so big. He reached his car—a sleek alien work of a car—and the car's door started to open automatically. Suddenly another car squealed, its brakes failing, and twisted headlong into the man and his car. A brilliant flash of light wiped out my sight, and the sound of the explosion shook the sidewalk where I stood. I almost fell down, trying to steady myself on that sidewalk, when back in reality I was standing on the solid tiles of the Moscone Center.

I removed the DreamPaints and came back to reality. "Thank you," I said quietly.

"You earned it," she whispered. Then she continued with her story.

After Gary's death, Karly could see only one way to fix the problem: to go to its source. Two physicists, Harold Rodin and Gary Mocineau, had figured out how to build a time machine, but until Karly had tracked them down no one had cared. She'd assembled the resources to come back in time . . . to plant a bomb and destroy this Virtuality Conference and everyone in it. Nothing like the DreamPaints would ever exist.

"And that's why I'm here," she finished quietly, neither defiant in her defense nor ashamed in her guilt. Perhaps she felt both, and they canceled one another out.

"Karly," I replied, "there has to be a better way." I gripped her shoulders in my hands, painfully. "You have to let me help you find another way."

She looked up, into my eyes. "Yes," she said. Her eyes were filled with love. My heart sank, for I knew she was not looking at me, but at her boyfriend whom I so resembled. I had more questions for her, but I couldn't stand looking into those eyes that looked at someone else.

I continued, inspired. "I still want you to come with me to the meeting tonight at 11, where everybody'll be. I want you to meet the people you want to kill. Do you understand me?"

She nodded, and after a brief hug, I turned and headed for Moscone North. My brain was ready to explode with new information, but I still didn't have a good explanation of what was happening: if Karly was from the future, then what about Cory?

I found Cory as easily as Karly: she was one of kind, save her twin. It took longer to break her down—somehow she was more formidable than her twin—but even Cory could not resist the look in my eyes, her dead boyfriend's eyes. And so I learned where she was from, and why she was so much tougher. She had grown up in the toughest future of all.

Molecular engineering had exploded onto the scene after the first Feynman Prize had been awarded. Advances came thick and fast . . . but not quite fast enough to prevent the Politician's Depression, which ground every development to a halt. The people were hysterical, and as happens in such situations, they voted in a new president who reflected their fears.

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Buck Canion was swept into office on his promises to end all dealings with the countries that had stolen America's jobs, and to stamp out the corruption in America's heart that made us weak and undeserving of greatness. He promised to bring forth a resurgence of moral living, and a renewed America. Even rumors of ties with Neo-Nazis could not turn aside the tsunami of his popularity.

He started with a series of show trials for the former President and Congress. The Constitution notwithstanding, the charge was treason, and the crowds standing in lines outside soup kitchens all over the country cheered as they watched the televised carnage.

At first Canion invested in nanotechnology to restore America's manufacturing base, but it became his passion when he realized how it could be applied to restore morality. With the power of molecular manufacturing he could produce and distribute miniature video cameras across the country virtually overnight: soon every room in every building was wired for the Eyes of Morality.

Imprisonment and executions for immoral behavior rose swiftly thereafter. When even Canion's own security police balked at the toll, Canion swiftly found more efficient and reliable enforcement with the Hands of Morality, molecular killing machines Canion could personally control without human intervention. Most were too small for the eye to see, which only increased their power to terrorize.

It took only a small step for Canion to see that the only remaining threats came from foreigners; it took less than a month to spread his dominion across the whole of Earth. And the last development he allowed was the creation of Morality's Immortal: he made himself young, and promised the world his personal Guidance, for time everlasting.

In this world Cory and Gary had uncovered the time travel theories of Rodin and Mocineau, and formed a desperate two-person rebellion. They had built a time machine out of molecular components. But the paranoid Canion had somehow come to suspect Gary's defiance, and when Gary's car exploded, Cory's mission had become more personal. She had come here, to destroy the future of nanotechnology, to ensure no one ever gained the kind of power Canion held.

I shuddered. "My God, what a horrible future! No wonder you're so determined to prevent it."

"I was hoping you'd understand," Cory replied.

I shook my head. "I do understand, but that doesn't mean I agree. There has to be a better way, Cory."

Hurt flushed her face.

"Nanotech doesn't have to be just a tool of dictatorship," I continued.

She shrugged. "In my world no one dies of hunger or disease," she admitted. "But neither does anyone laugh or smile." She waved at the bustling crowd. "There is nothing like this."

"Cory, I swear to you, I will help you save the future. But not like this." I paused. "Come with me tonight, to our midnight meeting. Meet the people you want to kill. They are good people too. Let us all help you."

Her shoulders were still straight,

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but something inside her fell. "OK, Gar—OK, Eric."

I wandered blindly down the streets around Moscone, trying to understand what I had learned. It took hours for me to even digest a basic facet of the truth: Karly and Cory had come from two different futures! Most people would have had enough trouble accepting one time traveler—here I had a pair of them, from mutually exclusive but parallel timelines!

I thought about the future as a path with a Y in it; it just didn't make sense. Occam's Hammer told me the truth was even stranger than I could currently comprehend: *that* was food for terror!

I turned my attention to the more practical issue: what to do? How should we avoid these twin fates, so hideous that Karly and Cory would travel through time to prevent them?

Cory's future guaranteed the most ghastly end of mankind ever imagined. It was also, it seemed to me, the easiest to prevent. In Karly's timeline Buck Canion never came to power. A dose of good immersive social virtualities, enough to do the on-line experiments that would provide an alternative to dictatorial government, was all we needed to stop the madman. It was funny, really, that there was not even a hint of VR in Cory's world.

And it was funny that there was no hint of nanotech in Karly's.

I blinked, and shook my head from side to side. Thinking of the future as a pretzel made my head hurt. I could hardly achieve a cogent thought, much less a coherent cause/effect pattern, but in the end I came to the following understanding:

Karly and Cory were mutually responsible for creating each other's timelines.

Karly, in destroying all vestige of VR work, created the VR-less world in which Buck Canion could thrive. Cory, in destroying all progress in molecular manufacture, created Karly's future, in which the machinery was not reliable enough for survival during a phase when humanity was struggling to redefine its relationship to itself.

These two timelines were not random selections, nor contradictory: rather, they were a stable configuration as a pair. One could only "exist" if the other existed too. Each brought the other into existence as a necessary precursor to itself.

It made sense, but only the kind of sense a madman could embrace. Or a physicist, if that was not the same thing.

It was almost time to go to the VR coffee klatch. I was eager to see Karly, to tell her what I had learned, to explain the true nature of the solution. I started to trot as fast as my bad knee could carry me.

As I hustled along I thought about how happy she would be. It was a good thing she had accepted my offer of help so easily, else I would not have had the time to figure it out. So easily . . . I paused to catch my breath, and realized the enormity of my error. I straightened up and ran, ran faster than I had run since the accident. My knee throbbed, then screamed in white flashes of agony. I ran faster.

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* * *

I stood in the darkness, recovering my breath, favoring my right leg. The meeting was about to start, and I started hoping that my paranoid nature had done Karly a disservice. . . .

A light footfall entered the room, the sound of feet that should have been happy. The lights came up.

"Hi, Karly," I greeted her, choking down my disappointment. "I was afraid I'd find you here."

"Eric!" She stared at me in surprise. Her hand was in her pocket.

"I wondered why you gave in so easily," I said. "After all, you traveled all the way through time to destroy these people. Sometimes I'm a touch dense, but I eventually realized why you were so agreeable. I gave you the perfect time and place to get all the most important people, didn't I? If you set a bomb off at some seminar during the day, you might have missed someone crucial, out for a donut or leaving the conference early. But no. I told you the one time, the one place, where everyone would be."

Karly started to circle me, one hand holding a box the size of a handgrenade, one hand in her pocket. There was no laughter in her eyes at all now, and as she looked back and forth between my face and her pocket, I knew how deadly serious this meeting had become.

"We can do this together," she whispered. She showed me the bomb, told me how it worked. "It's easy. Then we can be together."

I moved to intercept her. The meeting was going on in a corner room; this was the only adjacent room; Karly was moving to the shared wall. "You love Gary," I reminded her.

"I . . . you are so much like him," she said, and the surprise still made her voice catch. But she didn't stop trying to get past me.

"Karly!" I cried out. "I know how to stop this madness. I know why your future came to be, I know how to stop it!" I rushed into an explanation.

For a moment my words held her. But soon it became clear I had failed. Can you blame her for doubting me? I barely understood the twin timelines myself. Surely my talk of her twin sister Cory, whom she would create so she could create Karly, was the raving of a lunatic.

Could I have done better? I have asked myself that question a thousand times. Yes, surely today I could give a more succinct answer. But would even an answer cultivated and evolved over years of thought have been good enough? Such a useless question; I can never know.

We were face to face; I could feel the warmth of her breath on my neck, smell the perfume of her hair.

"Please, Eric, stand back," she said.

I stepped closer.

With a desperate cry of sorrow, she drew her right hand from her pocket, and thrust a six-inch knife blade toward my stomach. I deflected the knife, but not before she put a long ragged cut down my left arm.

She was strong and fast, but I was stronger and faster. She had tried to kill me; some primitive defense instinct took over as the blood dripped down my arm. I stepped aside, grabbed her knife hand, bent it to-

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ward her, and plunged the knife into her chest. I reached around behind her and plucked the bomb from her other hand.

She fell against my chest. "Eric, you have to stop them. Promise me you'll stop them."

"I promise," I said as tears streamed down my face, "I know how to fix it. Everything will be OK."

She shuddered one last time, and the light departed from her eyes.

I don't know how long I stood there, holding her. But in the end I laid her gently on the floor, wiped my eyes, and walked quietly to Moscone North, to sit in the dark of the room adjacent to the nanotech party, to wait for Cory.

With only the sound of my own breathing to accompany me, I had a few minutes to think about what to say to Cory. I sank into the realization that I dared not say anything. Cory was a nanotechnologically engineered person—her singing voice proved that much. She could be effectively impossible for a mere human to kill, even with the advantage of surprise. Without the advantage of surprise, what chance would I stand?

Cory! I desperately wanted to tell her that she couldn't do what she was about to do, that if she did, she would create the Karly's world, and Gary would still die, and she would fail again. But if I told her and she didn't believe me, how could I stop her? And if I couldn't even convince Karly to stop, what chance had I of convincing the sole survivor of a nightmare beyond any form of genocide?

And I had promised Karly that I would prevent her future from occurring, no matter what the cost.

I told myself that I couldn't really kill Cory, that after all, she hadn't even been born yet; indeed, since I had already killed Karly, Cory would never be born . . . at least, not as Cory.

No sound announced her arrival; I just saw her shadow in the hint of light trickling through the door. I flipped the lights.

She was already looking at me; with her nanotech enhancements, she had seen me in the pitch blackness, and I knew then just how difficult stopping her would be.

"Eric!" she whispered.

"Cory!" My eyes were full of tears as I stepped up to her.

I hugged her tight. Then I reached behind her ear. I pulled forth a purple rose. "For you," I choked out. While I was getting the rose, of course, I had delicately placed Karly's bomb on her back. I sobbed.

"What's wrong?" she murmured

"I will never forget this moment," I replied, "I promise you, everything will be all right." I stepped back, pressing my hands together .

She looked at me in puzzlement, then her eyes flashed as she felt the weight on her back. She reached around, quick as a cat, and—

The force of the explosion threw her dying body forward into my arms. The noise was deafening. I had a vague notion that the building was collapsing down on me, and that I deserved it. That was my last thought for a long time, that I deserved it.

Cory saved my life even as I was

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ending hers. Her molecular engineering was not enough to save her from direct contact with the blast, but it was enough to deflect the blast that otherwise would have left nothing of me to identify except maybe a couple of teeth.

Of course, with an explosion like that, it was still a miracle I survived. The ceiling did indeed collapse, and it took half a day for them to pull me out. Other people in the room next door were hurt as well, but there were no fatalities. Except for Cory, of course, who should have provided a most surprising autopsy.

But the police report said that there were no fatalities at all. Neither bomb fragments nor bodies were ever found, neither Karly's nor Cory's.

The police quite understandably picked me as the most likely suspect for planting a bomb. Indeed, while I was in the hospital, babbling on the pain killers, I think a plainclothesman interrogated me. But all he got was a lot of gibberish about trying to stop a beautiful girl from an alternate future from trying to blow up the Nanotechnology conference, and a duplicate girl from another alternate future trying to blow up Virtuality. In the end, with neither a motive to assign to me, nor even any evidence a bomb had been involved, they searched for other explanations. A multimillion dollar investigation found a cause: in a billion-to-one chance, a deep, secure natural gas pipeline had cracked, and a fissure had let gas trickle into the room, setting up the explosion. I later went over the evidence myself: they were right. In our timeline, that is what happened. I presume that, once their interlocked future histories were expunged from all possible timelines, Karly and Cory just . . . never existed.

It took a year or so for me to get my head straight. When I finally did, I realized that my relationship with Karly and Cory had only just begun. After all, I had promises to keep.

I switched tracks from biochemistry to finance. The change of direction thrilled my father, though it filled me with a regret that I will never outlive. Still, with Dad's financial backing, and my unique knowledge of the future of technology, I did quite well . . . better, in fact, than anyone in history. Dad was quite shocked when I sold VThink and JouleView short and helped capitalize a little startup called DreamPaint. He was shocked again when I shorted NTools and took options on MoleFab after Austin Zerr joined up. But his grin was wide as Texas when things went as I had already known they would.

It wasn't till after the Entitlement Crash—during which I was completely out of the American stock market, diversified into metals and other enterprises in debt-free Asian countries—that the columnists started arguing whether I was the New Bill Gates or the New Michael Milken. The one thing they all agreed on was that I was the richest man in the free world. I created the KC Futures Foundation to grant scholarships to promising young people entering college. One scholarship was won by Harold Rodin, to study nanotechnology; another was won by Gary Mocineau, to

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study kinesthetic virtualities. To my knowledge; in our present history, those two people have never met.

The Entitlement Crash, by the way, was the first indication that I had created a future different from either Karly's or Cory's. There were executions, unlike Karly's future, but fewer of them than in Cory's. The mobs shot all the living presidents, starting with the current one, and then burned the Congressional committee chairmen to death, but most of the rest were allowed to live. Many were later let out on parole, and allowed to enter honorable professions; a handful of these even became respected members of their communities.

Meanwhile, hundreds of new sociopolitical systems were simulated in virtualities. We didn't figure out the *Principles of Self-Organizing Groups*, but we did manage to at least amend the Constitution with the new Bill of Inviolable Rights.

Stuart Glennan and I became good friends, though in all these years we've never actually met in person. I fear he was one of the losers in the new reality. He never did become famous, though he did do one beautiful song, one that I personally like better than his greatest works in the other futures.

Virtuality and nanotechnology progressed rapidly, neither quite as fast as they had in their own futures, but fast enough to keep the whole world on its toes.

At first, I dreamed often of Karly and Cory, but with time even the dreams faded. The dreams came back once, briefly, as I contemplated asking another woman to be my wife. I never did marry.

I look back now and wonder at the unlikely chain of events that led me here. Invariably it leads me to ponder the nature of time and the Universe. Quantum mechanics defines its own set of virtualities, a seething emptiness teeming with untold trillions of virtual particles, of which only those that lead to a more stable, more valid state ever see the light of day. Are there virtual universes too? Did the universe, in its own ponderous way, sift trillions of slightly different universes to find one more stable than the Karly/Cory mutual future creation configuration? Could there have been "losers," universes in which:

—I looked slightly less like Karly/Cory's boyfriend?

—Stuart Glennan wasn't on-line when I went looking for him?

—That man on the white bicycle, so long ago, didn't speak to me of visions of the future?

—I reacted one second faster that night in a speeding car, and married Shea and played basketball? Oh God, don't let that have been a universe that could have been!

Well, the might-have-beens can be pondered forever by moldering philosophers. Meanwhile, I still had things to do and promises to keep.

The last and most painful part of my promise brought me here, to my little flower stand, for two hours on the specified day. The stand, at Berkeley's famous intersection of Durant and Telegraph, was open from 11 A.M. till 1 P.M. on July 10 every year. It was hot out here, but that was not the

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main reason I had to keep clearing the sweat from my eyes. My heart was beating a jagged rhythm; somehow, I was sure that this day, this year, was the end of my journey.

Though the People's Republic of Berkeley in the twenty-first century bore only a slight resemblance to the polyglot culture it had been in the twentieth, the street was still crowded with people who would have been distinctive anywhere but here. Still, when I saw him, I knew him; he stood out even here. Just as I myself did.

He was a tall fellow, wiry, with big hands—the kind of hands that looked natural only when wrapped around a basketball. He looked as I had, once upon a time, in a youth long ago. I understood clearly now, fifty years later, why Karly had stopped in her tracks when she first saw me.

Ah, Karly, Cory, who are you now, in the future that I have written for you? It didn't make any difference; I was so close now.

He had a purposeful stride, unlike everyone else on the sidewalk. He tried to stride right past my flower stand—but here he found someone as purposeful as himself. "Flowers," I said, blocking his way, jamming red and purple roses to his nose. "They're free, Gary, for you, for that wonderful girlfriend of yours."

I could see the puzzlement flicker in his eyes, though the flowers blocked my view of the rest of his face. I knew his thoughts: *Who is this guy? Wait, he looks familiar, like I've seen him before. Do I know him? How does he know me?* And, finally, *God, these roses smell wonderful! She would love them!*

I knew then that I had won the battle I most wanted to lose. I wasn't done yet—the pain would continue for a minute or so more—but I had broken his pattern, interrupted his trajectory, and he would not go toward his car again until I released him from conversation.

Oh, how I wanted him to go to his car! To hurry! To be out of my way, to leave her to me!

But my inner self snorted. What, after all, could Karly/Cory see in a crippled old codger like me?

Besides, I had already killed her twice. I would not, could not, hurt her again.

So I babbled. I don't know what I said, and it didn't matter; I could see he was thinking of how she would respond to the gift I had given him for her.

Finally, out of the corner of my eye I saw a car carom around the corner, out of control. The sound of an explosion filled the air. I didn't have to look to know that Gary's car had vanished in a burst of flame, across the street, half a block away.

He looked at the fireball which had once been his prize possession. "My car!" he said, mouth hanging wide. He looked back at me, dazed.

And then I heard the sound that brought tears to my eyes. The sound of happy feet, running urgently now, came up behind me. I took a step, and another, but my will was weak. I turned back just briefly, to see her, the new her, the girl whom my planning and effort had brought into existence. I had to see her just once.

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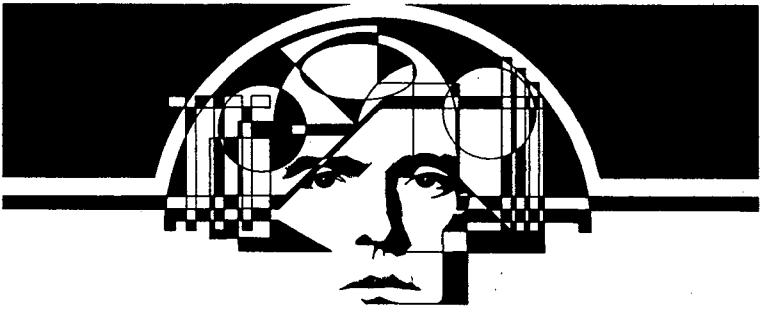
Of course her hair caught the sunlight, and her eyes were pools of blue, and even though she was afraid for Gary, she was radiant, more beautiful than she had ever been in any other past or future. She was the full expression of all the things Karly and Cory could have become in a compassionate universe.

Gary continued to stare at me. "You saved my life," Gary acknowledged in shock.

"Yeah," I choked out. I turned away and muttered, just loud enough for him to hear. "She earned it." Putting my cane down firmly, I hobbled across the intersection, and down the street past the wreckage.

I walked a long way. I did not look back again. ■



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Maya Kaathryn Bohnhoff

CONTENT WITH THE MYSTERIOUS

There's a fine line between the desire to know and the need to know right now. . . .

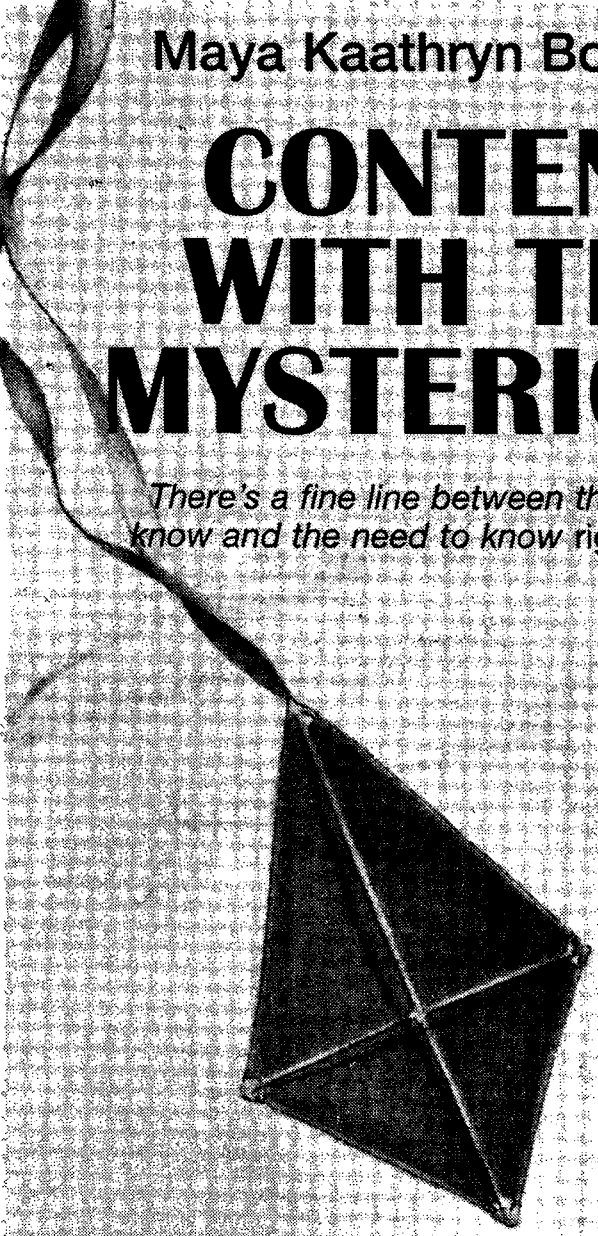

Illustration by Darryl Elliott

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Ken Shaw stared at the manuscript without really seeing it. The lines were gray blurs, a pattern of irregular stripes. He knew what it said, though; he'd read the march of words beneath his wife's byline.

"You'll love it," she said. "It's brilliant," she said. And he'd had no reason not to believe her. Most of what Lissa wrote, if not brilliant, was at least very good: sharp, cogent, witty. This, however—he grimaced—this was arrogant, self-congratulatory, and sarcastic. He imagined telling her that. Not pretty. He'd critiqued her before, of course, edited her prose. That was his job. But, at the moment, he didn't feel like editing, he felt like doing a hatchet job.

Sighing, Ken rolled his chair across the anti-static carpet and over to the office window. He was people-watching and contemplating taking a walk down the Embarcadero when he saw her charging through the manicured courtyard four stories below. She moved like a tornado with a fix on a trailer park. She always did. It was one of the things he loved about her. She researched her articles the same way, flying in, shredding, reducing the subject to matchsticks that could be easily vacuumed up—neat, tidy, and looking nothing like the original item.

Ken rolled himself back to his desk and tried to collect his thoughts. They refused to coagulate. *Fear of the storm*, he thought wryly, and slipped the article under the October issue cover layout. Maybe she'd grant him a reprieve. Let him bring up the article.

A moment later, she was breezing into his office, notebook computer over one shoulder, trendy but dilapidated safari jacket open over a black silk jumpsuit. "Well?" she said. "Have you read it?"

So much for a reprieve. Ken pulled the manuscript out from under the cover art and nodded.

"And?" She perched on the corner of his desk.

"It's well-written."

Pale brows shot up under a thatch of strawberry-blonde hair. "Well-written? Oh, Mr. Shaw, that's editorspeak for 'I hated every word of it.' What's wrong with it?" She got up, leaving her notebook on the desk, and began to pace. "I did good research. I conducted searching interviews. I collected solid evidence, evaluated it objectively—" She stopped in the middle of ticking off her processes and turned to stare at him bemusedly. "What? What's that sour expression for, my puckered pal? You look like you just swallowed some Vilex."

"You weren't objective."

The stare turned into a glare. "What do you mean, I wasn't objective?"

He shrugged. "You weren't objective."

"About what?"

"About anything in here." Her hands were on her hips, he noticed. A bad sign.

"Give me an example."

"OK. The meditation class."

She shrugged. *What about it?* her eyes asked.

He rubbed the bridge of his nose—a habit dating from when he had had to wear glasses. "Lissa, you were rude."

"Rude? Ken, the woman was hav-

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ing a room full of people meditate on a crystal that *didn't exist*. They took turns *holding* the damned thing."

"Did that give you the right to humiliate her?"

"Oh, please."

"Admit it, Liss. You didn't research this article, you went on a witch hunt. You didn't interview people, you played Inquisitor."

"I simply asked them to produce proof of their outrageous claims. I asked a woman who said she could read auras to read me a few. And that clairvoyant character, Dreyfus—all I asked him to do was foretell the outcome of a simple test."

"Did you hear yourself? 'That clairvoyant character'? He was 'that clairvoyant character' before you even met him, wasn't he?"

She glowered, arms folded.

"Well, wasn't he?"

"So?"

He flipped the first page of the manuscript over and read, "'Your job is not to debunk—leave that to the vice squad. As a scientist, you are not out to disprove or reject any claims out of hand, but to discover positive evidence in favor of them.'" He flipped the page back. "Despite that noble disclaimer, this article is prejudiced, Lissa. It's arrogant. Worst of all, it's not scientific inquiry."

Now she was gawking at him. "I don't believe my ears! You're *defending* this crap!"

"No. I am defending objective analysis, which is absent from this article, despite your claim to the contrary."

"Come *on*, Kenny. These people are fakes. They may be well-meaning, or misled, but they are fakes, nonetheless. If I can disabuse even one person of their irrational, puerile—"

"Fine, but don't try to pass your crusading off as objective, scientific inquiry. Above all, don't try to do it in my magazine."

"I don't believe this!" She turned her back on him and stalked across the room to fume in front of an Oriental print. "So, I suppose you want me to soften it, or some such nonsense." She raised a warning finger. "I don't believe in that. And I didn't think you did either; call pseudo-science pseudo-science—that was the *Skeptical Review's* ideal."

"This is beyond softening, Lissa. Your methods, the tactics you espouse—"

She spun to face him. "What's wrong with my tactics?"

He covered his face, rubbing at a headache that was trying to gain a foothold in his brain pan. He groaned.

"What do you mean, 'they're low'?"

"I didn't say that, I just . . . groaned. I've got a headache."

"Which I'm responsible for, no doubt. And I heard you, clear as a bell. You accused me of using low tactics."

"You heard what you expected to hear. I *groaned*. But you're right. They *were* low." He pulled his hands away from his face and tapped the manuscript. "Infiltrating their ranks, attending their meetings, even offering to give seminars or work on the newsletter, passing yourself off as a 'true believer'—all so you can debunk them. You advocate lying—"

"Ken, everything they stand for is a lie."

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He opened his mouth.

"And don't you *dare* say 'two wrongs don't make a right.'"

"I guess I don't need to—you just took the words right out of my mouth. And you're right. It's tantamount to lying on behalf of the truth. I find that hypocritical. I certainly can't advocate debunking agenda in the pages of the *Skeptical Review*."

"Debunking is too strong a term. I was investigating."

Ken picked up the manuscript, flipped to the last page. " 'Once you've gained yourself a reputation as a true believer, it may be a while before the locals tumble to the fact they've invited a hat pin onto the *Hindenberg*.' "

She smiled. "Clever, isn't it?"

He shook his head. "Clever debunking, Lissa. You were intentionally setting out to explode myths—having already decided they *were* myths. That's bias. It's prejudice. It is not good scientific investigation."

"You want me to rewrite it."

"Are you willing to lose the smug tone? Are you willing to ask questions without supplying the answers?"

"Wait a minute. Are you telling me to re-conduct my interviews, my tests?"

"Not all of them. Several of them would stand up just fine, if you reported the results more objectively. Although . . ."

"Although, what?" she asked warily.

"You did seem to go out of your way to make your participants . . . uncomfortable."

"I used a scientific facility."

"You subjected a woman with a verified formaldehyde allergy to the chemicals in a lab. She was, in your words, 'demonstrably uncomfortable.' You cite fear of failure. Maybe it was because her mucous membranes were swelling up and her stomach was turning over. She still did better than 50 percent on the aura readings."

"I will *not* redo my research. And as for the interviews and confrontations—I can't just throw them out. They're what gives the article punch. I will not rewrite it."

"Fine. Then sell it to a cult-basher. I won't print it." He tossed the manuscript to the edge of his desk.

"Fine. Someone else will."

"I've no doubt. As I said, it's well-written."

She snatched up the article and her notebook and tucked both under one arm. "Sometimes I wonder if you're suited to editing a skeptical journal. Maybe the *National Tattler* would be more your style. Or maybe the *UFO Times*." She turned and headed for the door.

Oh, great he thought. *This ought to be good for about three days of silence.*

"I'll talk to you again in about a week . . . if you're lucky," she said, and was gone.

(August 20, 1998—Interview: Dr. Petra Genoa, Ph.D., conducted by Kenneth Shaw of the *Skeptical Review*. Subject: precognitive experiences.)

SR: Would you call yourself a true believer?

PG: A true believer? In what?

SR: In psychic phenomena.

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PG: That's an awfully broad area. Could you be more specific?
SR: Alright. Extra-sensory perception.
PG: If by that you mean do I believe there are more than five senses—yes.
SR: Would you call yourself a psychic?
PG: Would you call yourself a dreamer?
SR: Excuse me?
PG: Sometimes you dream. Does that mean you define yourself as a dreamer?
SR: I see your point; but do you believe you have psychic powers?
PG: Now there's a loaded term: *powers*. I believe I have experienced extra-sensory awareness. I don't know if I can lay claim to *powers*.
SR: What sort of experiences are we talking about?
PG: Knowing something was going to happen in advance, for example.
SR: Precognition?
PG: (nodding) Yes, that's a fairly precise term.
SR: And you've experienced this often?
PG: More often than most people I've interviewed, yes. I have maybe, oh, one or two episodes per month (laughing). I seem to have them most often when I'm ovulating.
SR: Seriously?
PG: Seriously.
SR: Describe a precognitive episode for me.
PG: The first one that really got my attention was the day of my high-school graduation. I was sitting there, during the ceremony, when I had this sudden conviction that the girl sitting next to me—a close friend—was going to lose her father that night.
SR: It just came out of the blue, then? You weren't thinking about your friend?
PG: No, I wasn't. And I felt horribly guilty. I mean, what a thought to have about a friend's father! I almost said something, but—good God—what do you say? 'Gosh, Rose, I just had the weirdest thought. . . .'"
SR: What happened?
PG: Her father was killed in a car wreck on the way to the graduation. I remember the look on her face when she realized he was late. She kept glancing out the door, while I sat there and just about peed in my pants in anguish.
SR: And that was the first time you had that awareness?
PG: No. That was when I realized . . . *suspected* I had some sort of . . . sensitivity. You see, before, it was always positive. I'd get the sudden feeling that I'd win a tennis match or an essay contest or receive an unexpected present or get a call from someone I hadn't heard from for a long time. That was the first time I couldn't explain it away as wishful thinking.
SR: The dark side of ESP.
PG: You could say that.
SR: Doesn't your belief in ESP conflict with your position as a professor of psychology?
PG: Now, I happen to know that you're a philosophical theist. Doesn't your belief in a deity conflict with your position as the editor of the *Skeptical Review*?
SR: I'm not against belief, just *ignorant* belief.
PG: Can't argue with that.
SR: To what do you attribute your precognitive experiences?
PG: I don't know. I tend to think it's a sense we have, or a talent, maybe,

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that develops or fails to develop just like any other.

SR: Why don't I have it?

PG: Can you sing?

SR: What? Not really.

PG: Me neither. But I know many people who can. If they can sing . . .

SR: OK. But isn't it more like sight or smell?

PG: I don't know. Is it? Or is it like the ability to make music or write . . . or conduct interviews? What makes one person a brilliant performer and another totally graceless? People ask me to explain my awareness. But how do you explain that sort of thing? How do you explain Mozart's musicality? The man pulled symphonies right out of his head and put them on paper—every note right the first time. You suggest it's like sight. Fine. We can explain blindness, even if we can't always cure it. We've yet to explain Mozart.

SR: Would you be willing to have your abilities tested under controlled scientific conditions?

PG: Willing, certainly. But you see, I'm a skeptic, too. I'm skeptical about my own ability to be precognitive on demand—mine or anyone else's. I've never been able to sit down and meditate my way to precognition. It's like trying to pull in my favorite radio station; sometimes it comes in clear as a bell—sometimes it's pure static. And it's subjective as hell. *I* don't believe it when someone walks up to me and says, 'I see auras.' I've personally never seen one.

SR: But you *have* foretold the future.

PG: Don't put words in my mouth. I've had brief, uncontrollable precognitive episodes. Like . . . like sneezes. Can you sneeze on command?

SR: If someone waved ragweed under my nose, maybe. So, you don't believe ESP can be scientifically verified?

PG: I'm not sure. Maybe someday we'll be able to set up the right conditions or ask the right questions or take the right measurements. So far, we haven't been able to. No psychic ragweed, I guess.

SR: Some people are of the opinion that if you can't measure something scientifically, it doesn't exist.

PG: But doesn't that call into question the existence of a lot of things we take for granted? Things that are critical to the functioning of our society?

SR: Such as?

PG: Well, at the risk of sounding smarmy—love, truth, trust, honor, loyalty—that sort of thing. Even musical or artistic talent.

SR: Some people might say that's not the same thing.

PG: How do they know? If the thing's not measurable, if it's as subjective as love or loyalty, how can anyone say what it is or isn't if they haven't experienced it? I've *experienced* it and I don't know what it is. I only know it *is*. I can't convince the scientific community it is, because they can't measure it. They can't convince me it *isn't*, because I've experienced it.

SR: What about evidence, though? Mozart provided evidence of his talent. He composed symphonies that orchestras worldwide are still playing. What evidence can you adduce that you really have had these experiences?

PG: Good question. I'm conducting an ongoing project wherein subjects,

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such as myself, record their precognitive impressions. Altogether, I've gathered a study sample of fifteen other people who share this, um, little affliction. We have a co-monitoring system in place. When someone in the program has an episode, they call their assigned monitor and describe it. The description is recorded and logged and we wait and see what happens. If the event occurs, the monitor signs an affidavit and we attach any corroborating evidence to the file. It's the best we can do for now.

SR: Measuring the Mozart factor.

PG: Measuring the Mozart factor. I like that. Can I use it?

Ken flicked the notebook from play mode to record and added some voice notes, watching the words march across the flat display. "Be it noted that I did look over Dr. Genoa's documentation and interviewed two project monitors. Neither of them had ever experienced any of the phenomena under study. In fact, they viewed themselves as being originally skeptical or, at best, neutral to the subject of ESP. One of the "sensitives" had an 82 percent accuracy rate over thirty-two recorded events; however, I must note that some of the predictions are vague enough as to be unfalsifiable. And, of course, this still amounts to hearsay evidence and necessitates trust in the perceptions and scruples of the group monitors."

Ken pondered that. Is that what it would always come down to—having to trust the word of a go-between? And, reluctant to do that, would he only trust what he, himself, perceived or observed?

He had keyed the phone program before he thought about what he was going to say and gave the computer Dr. Genoa's number. To his surprise, she answered her own phone, her dark face appearing immediately on his display.

"Doctor! I'm surprised to catch you in your office."

She smiled—a flash of brilliantly white teeth. "I suppose I should say I had a feeling you'd call."

"Did you?"

"No."

He returned the smile. "I have an offer for you. I'd like to serve as a monitor for your project."

"Really. Are you from Missouri, by any chance?"

"Close—Alaska. And yes, I *do* want to be shown. I'd like to take on a couple of your most accurate people. Victor Chin, I think, and you, if you'd be willing."

She nodded. "Alright. You've got yourself a deal."

"Great. Now, I noticed that your episodes tend to be cyclic—"

She laughed, dreadlock bells jingling against her earrings. "Cyclic psychics, huh? I sure hope the media doesn't get hold of that."

"I *am* the media, remember?"

"No. You are a respectable scientific journal. *The Tattler* is media."

"Thanks." He appreciated her making the distinction. "Now, as I was saying, I was wondering if you'd thought of setting up some sort of brain activity scan during your most susceptible periods."

She seemed immediately open to the idea. "Brain Pattern Monitoring?

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I'd thought of that, actually. UC Davis has a new remote BPM that can be worn away from the hospital while it relays brain activity back to the facility. They've been using it to monitor seizure-prone patients, looking for an early-warning signal. Unfortunately, they're reluctant to let it out of the house. Especially for—oh, shall we say—frivolous projects."

"But, you'd be willing to wear a scanner?"

"You bet."

"Fine. I'll see if I can call in some favors."

The expression on her face changed. "Ken, are you ready to start your job as monitor?"

"Sure . . . I guess. Why?"

"Your wife is going to experience some sort of trauma."

"What?" The tone of quiet certainty at once chilled him and raised his suspicions. "Emotional or physical?"

"Emotional . . . art gallery. I had a sudden impression of an art gallery or museum or exhibition maybe."

"When?"

She shook her head with a sibilant clash of bells and earrings. "I don't know. I rarely know, exactly. Usually my range tops out at about three months. Can you save this conversation to a file?"

Ken nodded, righting himself emotionally. "Can you be any more specific about the nature of the trauma?"

"Fear. I know she'll be frightened. I don't know why."

Later, when he viewed the conversation log file, Ken couldn't help but wonder if Petra Genoa's prediction was entirely coincidental. Could she be playing on his emotions? He went back to the case histories he'd gotten from her, in search of some sort of proximity effect. He found it; the precognitive episodes for the three subjects he studied related preponderantly to people they were in close contact with either physically or emotionally.

He had to smile at himself. His skeptic's sensibilities told him he should welcome evidence that he was being manipulated, but he knew such evidence would only disappoint. In some peculiar way he preferred being disturbed by Dr. Genoa's prediction to being disappointed by her duplicity.

"What did you say?"

Ken peered up at Lissa. She was gazing at him distractedly across the width of the coffee table, the display of her own notebook casting odd light-shadows across her face.

"I didn't say anything . . . I don't think. I thought I just cleared my throat."

"You muttered something about predictions. What are you working on?"

"Oh, I interviewed Professor Genoa Tuesday."

"Petra Genoa, the psychic psychologist? They should revoke that woman's Ph.D."

"She graduated at the top of her class."

"What good is that when she ends up retiring her brain to New Age mumbo-jumbo?"

"How do you know that's what she's done? Have you talked to her?"

"I read an article on her in one of those true believer magazines."

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Ken failed to muzzle his laughter. "And you trusted their journalism? C'mon, Liss. Normally, you wouldn't believe a word they printed. Why don't you read *my* interview?"

"Maybe I will." She eyed him suspiciously. "You don't think she's legit?"

"I'm reserving judgment until I've finished my own study. I'm monitoring the project she's conducting in precognitive episodes."

"You're kidding."

"Not at all. Who better to monitor alleged psychic activity than a skeptic?"

She smiled. "Right, as always. You were right about my article, too."

He raised startled brows at that most un-Lissa-like admission. "I was?"

The smile broadened to a cat-eat-cream grin. "I *did* sell it somewhere else. Elaine Dehaut bought it for *Aware*." She bent back to her work.

He didn't remind her that *Aware* had a reputation as a forum for a fanatical extreme. Ken hated to admit the existence of that element within the skeptical community, but they were there—those who had ceased pursuing the truth in favor of pursuing agreement with their own personal world view. Of course, everyone did that to one degree or another. Everyone made assumptions, betrayed bias, and struggled with prejudice.

For some reason, that conjured the Biblical story of Jacob struggling with the angel. "Jacob," he recalled, was Hebrew for "deceiver." Prejudice was certainly that; it could make an unwitting fanatic of anyone.

She hated dreams like that. She'd had mercifully few of them. They disoriented her, made her feel ill-at-ease in the waking world. "Night-ponies," she called them. Dark dreams, but not black enough to qualify as nightmares. They were usually murky, leaving nothing behind but a smudgy residue studded with tiny pockets of lucid detail.

Lissa could still vividly recall one such moment when she hung above her bed, looking down on her own sleeping form, Kenny snuggled beside her beneath the covers. She remembered thinking there should be hair in her eyes, but there wasn't. Nor was there a hand to wipe it away with.

She had the impression that she was rising; the figures below stirred slightly, growing smaller. She had feared a collision with the ceiling, but a "glance" upward revealed only an endless, star-studded sky. She looked down again and saw her own rooftop.

Funny, she thought, *I've never seen it from this angle before.*

Bright orange fabric fluttered against the chimney. She remembered seeing the next-door neighbor's boy flying a kite that color the weekend before.

She began to move upward again, the rooftop receding too quickly. Terror lanced through her and she fell—no, was sucked down an invisible funnel through the rooftop into bed. She woke with an electric jolt, sitting, sweating, cold and clammy, heart haring.

She *hated* dreams like that. Associated them with stress. She associated this one with the stress over her most recent article. She grimaced, close to

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admitting to herself that Ken was right about more than its salability. She hadn't meant to assume such a cynical tone. She really had set out to be objective, but the very thought of anyone granting credibility to that supernatural twaddle set up her hackles. The thought of people like Ken and Petra Genoa—educated people, *bright* people—buying into it made her want to rage.

And there was no relief from that rage in her morning schedule. She had two interviews lined up—an NDE and a Chinese healer.

The Chinese healer was first; a whimsical diversion. Professor Lin Wen was a scholarly gentleman who conversed as comfortably about Tantric Buddhism as he did about chemistry—a subject in which he held one of his two doctoral degrees. He discussed how the spiritual essence, or *qi,* possessed by an individual could be read to predict fortune, and channeled to change it.

Lissa asked how he, a man of science, could accept and even promote something of which he had no scientific proof. He smiled and asked if she had scientific proof for everything she believed to be true.

"No," she said, "but someone has."

"Ah," Wen responded. "Then you depend upon the science of others."

"Most of us do, largely because scientific ideas are falsifiable. *Qi* isn't."

"Ah," he said and looked inscrutably archetypal. He parted from her with avuncular concern, prompted, he claimed, by the lack of balance in her *qi.*

Great, she thought wryly. *No more PMS. Now I can just say my* qi *is out of balance.*

Her second interview took her to a pleasant neighborhood of neat, older homes where she expected to hear of Julie Pascale's near-death experience. The case was particularly interesting to her because of the media coverage it had received eight years before. It was still a high-profile case—high impact, if she could break it. But when Pascale's husband met her at the door, she knew she was going to be disappointed.

"I'm sorry," he said, "but my wife has changed her mind."

"About the near-death experience?" The sarcasm was born of frustration.

He frowned. "No. About the interview. She's not feeling well."

"I can reschedule."

"I'll tell Julie that. I'm sure she has your number."

And I'll bet I have hers, Lissa thought irritably. She ought to congratulate herself, really; another true believer ducking the hard gaze of rationality. But she didn't feel congratulatory. Julie Pascale had a particularly well-documented set of NDE experiences and Lissa had been looking forward to a one-on-one confrontation. She drove home accompanied by acute disappointment.

She was pulling into the driveway when a momentary recollection of last night's odd dream drew her eyes to the chimney. A splash of orange caught her eye. She hit the brakes too hard and the Saab's tires yelped in protest. Nestled against her chimney was the neighbor's orange kite. She was fascinated. This was exactly the

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sort of thing that a "true believer" would take as a psychic experience, yet she knew she had merely dreamed, spinning off stress and the events of the previous day. Though she didn't consciously recall having seen the kite on the roof, she certainly *could* have caught a glimpse of it, and she definitely recalled seeing it in flight.

She was in bed, asleep, before Ken got home. She half-dreamed him entering the room in a reptilian slough of textile, kissing her cheek, brushing his teeth, slipping into bed beside her. She dreamed it from above—spider's eye view—and he was no more than settled in when she was out on the lawn watching a peculiar ritual.

A car pulled up across the street and several young men, black clad, got out. Whispering, laughing, they darted among the neighbor's trees and shrubs, trailing gauzy webs of white. Amusement bubbled. They were teepee-ing the Rathman's house! Feeling as if she were afloat, Lissa drew nearer to the car—a dark green Saturn Electra.

A light went on inside the house and the boys fled with a slamming of car doors. Voices distracted. Not, oddly, the shouting of irate neighbors. She had expected that. She did not expect the well-modulated tones of conversation.

A woman's voice: "Photography has always been a passion of mine. Since I was a child, really. Now, it's my way of observing and absorbing the world."

Lissa's dream faded to black in a wild sensation of sucking speed—Alice down the rabbit hole. The voice in the black changed: "Recently, you absorbed the sights of Tannu Tuva and showed Westerners what must surely be a lost world—a Shambala. What is remarkable about these photos is the contradictory senses of alienness and familiarity they evoke. I am looking at a photo of a group of standing stones. Near them is a circular tent—"

"That's called a yurt."

(Striped fabric, sheepskin, an odd wooden door.)

"A yurt. Before the yurt are a couple of young men in loincloths doing a dance that looks like, well, like the funky chicken."

(Stocky, muscular bodies, arms akimbo, grins the sole adornment save for skillfully tied, fringed cloths. Nearby, an audience laughs and applauds, dark eyes glinting.)

"It's called the Dance of the Eagle and it's done to honor the patron spirit. They're preparing to wrestle. The quality of their dance will determine which opponent they're paired with."

"I'm out of the shower, Liss."

She stirred. Black faded to gray.

"Describe the next one for me."

"C'mon, Liss, up-getting time."

(Semi-dark gallery. Black and white photo, struggling toward color. A man clad in a combination of feathers, fiber, and colorful wood clutches a painted drum.)

"Chakar O is equal parts shaman and Buddhist bhikku. The drum is used not only to accompany the dancers, but to please the spirits and call down the bounties of the spiritual realm."

(Dancers; they are frozen in midstep, feathered headdresses in mid-

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bob. They could be Cheyenne or Sioux instead of . . .)

Where the hell is Tannu Tuva?

"Lissa!" The radio snicked off.

She came fully awake.

Ken smiled at her. "Welcome to the land of the living. Where were you?"

Lissa stretched and yawned. "At a photo exhibit. . . . What? What's that look?"

He shook his head. "Nothing. Just . . . nothing." He scurried downstairs.

He left before she did and so she sat, vagrant, over breakfast, nursing a second cup of coffee. She was rinsing her cup and regretting the loss of the Pascale interview when the phone rang. She was both surprised and smug when the other woman's new-age-gentle voice came over the line.

"Ms. Shaw, I've thought this over and—and I do want to talk to you."

Lissa made an immediate appointment, hurrying to gather her notebook and scramble out the door. She had backed down the driveway and turned the car when she caught sight of the Rathman's house. Slung between their mimosa trees, toilet paper fluttered festively in the breeze. Several rolls of the stuff littered the lawn.

Her mind did a double-take. *Oh, God, I've started sleepwalking!* She groaned. Which meant she might have wandered out into the street in nothing but an oversized T-shirt. She hoped she had only gone as far as her bedroom window.

Behind her, someone honked. She unstuck herself and drove to Tiburon.

The first thing she noticed about Julie Pascale was the vulnerable expression in her large brown eyes. The second thing she noticed was that, in crisp linen pants and a silk shirt, she did not look the least bit New Age-y. The third thing she noticed was that she walked with a cane. It was the result, Lissa learned, of the same experience that had gifted her with the NDE—in this case a near-drowning.

The story was typical in its major points: There was a great Light which the subject was drawn toward ("I was drawn to It on a—a raft of love. It was the Beloved. Just that."), other souls who milled about between heaven and Earth ("They were so confused . . . so lost. They didn't know where they were."), deceased relatives about whom she learned volumes at a touch ("I'd never met my grandfather before, but now, I felt I'd always known him.")

It was, perhaps, atypical in the angel's-eye view of Earth Julie described—a view that encompassed all people, in all ages, working their way toward ever-advancing levels of unity. Yet, typically, she was nearly touching the Light when she was sent back to Earth/Life in the company of what she described as "two souls." ("They had the most amazing sense of humor.")

According to Julie, she came upon herself in the Emergency Room at UC Davis. ("I was on a gurney, and a doctor—a heart specialist named White—had been giving me injections of adrenaline. He pronounced me dead and started to walk away when my GP—Dr. Harris—came in and asked what he was doing. He said, 'I've done all I can.' And Dr. Harris said, 'Like hell you have.' ")

Dr. Harris pounded on her chest and gave her further injections. ("I

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wanted to shout at him to stop. But he couldn't hear me.")

Forty-five minutes after she had drowned, twenty minutes after the heart specialist had pronounced her dead, Julie Pascale came back to conscious life.

"It was like being sucked down a drain," she said.

Lissa shook off the chill of a dream memory and readied her questions.

LS: I would think, after forty-five minutes of death, you'd have sustained some brain damage.

JP: I did. I had to learn to write again and speak in coherent sentences. The left side of my body is still weak. Poor Dr. Harris. When he came into my hospital room later and found me crying, I'm sure he expected some thanks or praise. Instead, I showered him with incoherent abuse. I wondered how he could dare bring me back. I almost hated him for it.

LS: What you say you saw in the ER—how close is it to what other people recall?

JP: You mean, how close is it to what really happened? Ask my psychologist. Ask Dr. Harris. There was a nurse, too—a Mrs. Yamaguchi. I have their signed statements, of course, but you might want to talk to them directly.

LS: Your psychiatrist—do you still see him?

JP: Her, and she's a psychologist. Yes, I still see her from time to time. As a friend, not as a patient. I have copies of her statements as well, if you'd like to see them.

LS: You were very thorough.

JP: No, Dr. Genoa was.

LS: Dr. Genoa? *Petra* Genoa, the parapsychologist?

JP: I don't think she considers herself that. She certainly didn't when I met her in the hospital. I had a terrible time convincing her what happened to me really happened. I'll never forget her parting volley the day I was released. "Take my advice," she said, "don't mention this NDE stuff to anyone else. Don't talk about it; don't even *think* about it. People will think you're crazy, documentation notwithstanding." She was right, of course.

LS: But you didn't take her advice.

JP: No. I couldn't not think about it. It changed my life. I had to talk about it and wonder at it and pray about it. And I had to use it to help other people.

LS: How so?

JP: I work for a Youth Hotline. We deal with drug abuse, domestic violence, suicide prevention—any and all self-destructive behavior. I try to use my experience to keep other young people from ending their lives prematurely.

LS: I find that contradictory. If you know what it's going to be like in the next world, if you find it so wonderful, why would you want to keep others from experiencing it? In fact, why didn't you contrive to return there yourself?

JP: I learned many things through my experience, Ms. Shaw. One of them was that the next world isn't wonderful for everyone. Those spiritually confused souls were just that. They were unprepared for death—for *life* in that . . . realm. I also learned that life really *is* sacred. It's sacred to the Beloved, and therefore, it's sacred to me. The key word is "prematurely." I want to go Home, but I'll wait till I'm called.

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Listening to the playback, Lissa chuckled. *What marvelous furnishings decorate the houses of the true believer.* A "raft of love"—she made a note to call it the "love boat"; God in the persona of the Cosmic Lover; disembodied spirits who cracked jokes. Cosmic comedy. *As if the homely details could make it real.*

Ken stared at the invitation in his hand as if he expected it to sprout fangs and bite him. In a sense, it had done just that; the graceful script contained a quartet of verbal teeth: Photographic Exhibition, Amsted Gallery.

"Think you two can make it?"

He looked up into the eager face of his editorial assistant, Terri Mendez.

"I hate to be pushy, but, well, Naomi is my cousin and I guess I'm proud of her. She does wonderful work."

"I'll, um, I'll talk to Lissa. I'm not sure what our plans are that weekend." Lie. He knew exactly what their plans were—nothing. He'd change that, he decided. A romantic weekend up the coast was easy enough to arrange. Lissa need never see the invitation.

Guilt poked him in the forebrain. Lissa was an adult. An adult who hated, above all things, to have decisions made for her. That, and the realization that he was granting too much credence to something he had every reason to be skeptical of, kept him from throwing the invitation away. It made him lose track of it until he got home, unloaded his briefcase, spread his papers out on the sofa and heard Lissa's voice say, "Oh, what's this?"

Ken made his face blank and managed to sound nonchalant. "Terri Mendez's cousin, Naomi Whitehorse, is a photographer. That's an invitation to her exhibit."

Lissa's eyes widened slightly. "Really? I've heard of her . . . I think. Sounds interesting. Do you want to go?"

He tried not to look wary. "If you do."

"Sure. I'd hate to disappoint Terri."

She sat down on the arm of the sofa and circled his neck with her arms. "So, what's for dinner, O Domestic God?"

His shoulders sagged. "Oh, yeah, it's my night, isn't it?"

She looked at his face and laughed. "Never mind. I'll go stick a pin in the phone book."

"Bad for the display," he said, and she laughed again.

Bemusement tickled him. Lissa was going to an art gallery. He couldn't imagine how that could be a traumatic experience. The more he thought about it, the more he thought Petra Genoa must have overreacted. Still, he had to allow, he was impressed. He supposed Dr. Genoa could have discovered the connection between his editorial assistant and the photographer, could have assumed he would receive an invitation to the exhibition and would include his wife, could have made her prediction as a way of manipulating a potential detractor. But Occam's Razor cut against such Machiavellian intrigue where simple coincidence would suffice.

It was the week from hell. The weird dreams continued, leaving her tired and listless. Fatigue made her angry with herself and, habitually, she

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transformed her anger into zeal. She composed a sharply skeptical, tongue-in-cheek piece about the Chinese healer, but the Pascale NDE, though met with equal zeal, yielded only frustration. Her interviews with the doctors, nurses and medical attendants on duty during the eight-year-old episode corroborated Julie's account of the scene in ER. All agreed that the girl could not have been physically aware of what was going on around her.

"How can you be so certain?" she'd asked Dr. Harris.

"She was *dead,* Ms. Shaw."

"Evidently not."

The old man had raised a mottled eyebrow. "Then perhaps we need to redefine death."

Julie's mother was the one to whom she had first described her experience. It was there Lissa expected to find her angle; she hoped to surprise a confession from Mrs. Joyce Delaney that she had relayed facts to her daughter rather than the other way around. She was disappointed. Arms folded across her chest, looking uncomfortable in her own living room, the older woman insisted she recalled, vividly, the day of Julie's return to wakeful consciousness.

JD: She told *me*. The words that were said, the actions that were taken, the medications they gave, even the amounts.

LS: After eight years, you're still convinced of this?

JD: Ms. Shaw, I realize people like you—people in your line of work, I mean—have a vested interest in making people like Julie look foolish and weak-minded, but I *couldn't* have told her some of that stuff. I wasn't listening to dosages and chemical compositions; my daughter was dying right before my eyes. She *died* right before my eyes on that boat dock.

LS: I have no desire to make Julie look foolish or weak-minded, Mrs. Delaney, and the only thing I have a vested interest in is the truth. Isn't it more likely that you simply absorbed more of what you were hearing than you thought, and that Julie gleaned what she "remembered" from the ER from you and other visitors?

JD: I did not put ideas into my daughter's head, Ms. Shaw.

LS: Yet, Julie told me she had some brain damage that necessitated her relearning how to write and speak. How could she have relayed so much information to you?

JD: She had trouble with some words, some sounds—like her tongue was uncoordinated—but she obviously knew what had happened to her, and she spoke well enough to communicate it.

LS: Were the two of you alone when she first told you her story?

JD: Yes. Does that make a difference?

The artless question made Lissa embarrassed and angry in turns—embarrassed because it *did* make a difference, angry because she hated embarrassment.

The ER nurse, Evelyn Yamaguchi, was Lissa's next interview. The woman was nearly as quakingly amazed in retrospect as she had been at the time of the incident.

LS: In your estimation, how accurate was Ms. Pascale's account of what

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happened in the ER while she was . . . unconscious?

EY: She wasn't unconscious, dear, she was *dead*. Accurate—oh, my, yes—she was accurate (rubs her arms)! It still gives me chills, just to think about it. The conversation between Dr. Mead and Dr. Harris was practically word for word; the instructions to the nurses (shakes her head) . . . unbelievable.

LS: Yes. You were one of the trauma nurses, then.

EY: (nodding vigorously) I was with Julie from the time she came into ER until she left ICU.

LS: Think about this for a moment, Mrs. Yamaguchi. UCD is a teaching institution. Isn't it possible Julie Pascale overheard a team of doctors going over her case history as she was regaining consciousness in ICU?

EY: Her case history—very possibly. But not the conversations and arguments that took place in the ER. No, ma'am. Doctors don't hash over arguments on rounds. They discuss treatment, progress, prognosis.

LS: What about the nurses?

EY: I don't know if you've ever been in intensive care, Ms. Shaw, but nurses don't gossip in the patient's rooms. That only happens in soap operas.

There was only one other person Lissa could interview who might throw some light on the Pascale story—Dr. Petra Genoa. She resisted doing that interview for the simple reason that Petra Genoa was not a reliable witness. Her credentials as a psychologist, however good they might look on paper, were contaminated by her work in parapsychology. They would still be impressive to the average reader—if someone of that stature could believe in life after death, the logic went, then might it not be true? Human beings were nothing if not enamored of possibilities.

That nagged Lissa as she attempted to compile her notes late on a Thursday evening. She knew the article wouldn't be complete without Genoa's input, but she couldn't bring herself to face another immersion into the true believer mentality. It helped not at all when Ken came home puzzling over the results of his tenure as Genoa's project monitor.

"I have to ask myself if there isn't something here, Liss," he said, half to himself. "Something more than can be attributed to chance and unfalsifiable predictions. With most of the subjects it's six of one—half-dozen of the other. But this Victor Chin—his predictions have been remarkably accurate. This is fascinating. I'm hoping that when Dr. Genoa's BPM is installed we'll get some idea of the brain activity involved when she receives precognitive impressions."

God, if he could only hear himself—"received precognitive impressions"! He was beginning to sound like he *believed* in this stuff.

"Coming to bed, Liss?"

"Huh?" She roused out of a tangle of thought and glanced at the staircase. "Uh, not just yet."

He sat down across from her on the coffee table, scooting her papers and notebook aside. "What's wrong, Lissa?"

"Why? Why should something be wrong?"

"Something shouldn't. But it *is*. You look *so* worn out. You toss and turn in

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your sleep. . . . Maybe you should see a doctor."

She did not have a poker face. "I'm doing more than tossing and turning, I'm afraid. I'm sleepwalking."

"What? I haven't seen any evidence of it."

"How could you? You sleep like a hibernating bear."

"OK, but what makes you think you're sleepwalking?"

"I've evidently wandered into the yard . . . on a number of nights and seen things going on in the neighborhood."

"Such as?"

"I saw the Rathman's house get tee-peed. I thought I was dreaming, but when I woke up the next morning, lo and behold, the Rathman's house was . . . well, you saw it."

"They didn't see you—the boys who tee-peed the house?"

Lissa nearly giggled. She must've been standing right out in the street . . . wearing only an extra-large T-shirt with the 49'ers quarterback on it. "I don't know."

Ken looked down at his hands, folded between his knees. "Well, I have to admit, log that I am, even I've noticed you've been had some pretty restless nights. You look exhausted. You *are* exhausted," he added and she realized he was afraid she might be physically ill.

She hastened to agree with him. "I'm pretty drained. I suppose I ought to see a doctor."

By morning she was convinced of it. Another night of vivid aerial dreams left her wide awake by four A.M., waiting for sunrise. But a complete physical revealed that, except for suffering sleep deprivation, she was perfectly healthy.

"What causes sleepwalking, doctor?" she asked. "I've never done it before. Or, at least, I don't remember doing it. Although, I've always had unusually vivid dreams."

"Actually, not remembering is a normal function of sleepwalking." Dr. Velasquez leaned back in his chair, looking cool, unruffled, and relaxed. "Retaining any memory of the events is highly unusual. As to what causes it—we don't precisely know. We *do* know it's a timing problem."

"Excuse me?"

"At times during non-REM sleep a dissociation can occur between cognition and behavior. What that means in neurological terms is that the upper brain is not responding to the signals from the lower brain. The lower brain signals for REM sleep; the upper brain doesn't respond. In the resulting confusion, the waking and sleeping 'worlds' become intertwined and the body begins to act out dreams."

Lissa shook her head. "But I'm not acting out dreams. I'm walking around seeing things that are actually happening."

Dr. Velasquez considered that. "Alright. Could you be awake but groggy?"

"No. No, I'm not awake."

"Are you sure?"

"I'm *dreaming*. I don't . . . walk out through the door, doctor. I fly out through the roof."

"Which could certainly describe what it feels like as you pass from dreaming into partial awakening."

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Lissa felt suddenly foolish. "That sounds reasonable."

Dr. Velasquez, consulting his computer screen, didn't seem to hear her. "You mentioned insomnia. Have you been depressed lately?"

Lissa laughed. "Only about my resistance to sleep—or at least to dreaming."

"Well, Lissa, there's nothing physically wrong with you, that I can see. Your MRI shows no abnormalities. We could try monitoring your sleep."

"You mean with electrodes and all that? Why bother? I think you're right. I'm sleepwalking and as I begin to wake up, I have . . . interesting dreams."

"Lissa, that's a symptom, not a cause."

"Alright. What might cause something like this?"

"Often sleep disorders are caused by stress, which is something for which I often prescribe meditation."

Lissa, snatched from the verge of relief, ogled. "Meditation? You've got to be kidding."

"Not at all. Concentration on something other than your anxieties—whether it be a pretty scene or a pleasant memory or an actual spiritual mantra—"

"Please, doctor—this New Age stuff—"

"There's nothing New Age about it. Meditation is as old as man's desire for control and serenity in his life."

"I do not believe in meditation."

The doctor gave her a look he probably reserved for recalcitrant children who refused to take their medicine. "Fine. Then I'll prescribe some relaxation exercises. Can you handle that?"

Can I handle that? Lissa stared at the prescription. It outlined a series of exercises (*Toe-clenches, for godsake!*), and recommended that she see a therapist if her insomnia and anxiety continued.

She held out against doing the exercises for two hours of what promised to be a sleepless night.

"What are you doing?" Ken asked drowsily.

"I'm meditating," she growled and rebelliously clenched and unclenched her toes.

She held out against the idea of seeing a therapist until the following Tuesday. The therapist, a moon-faced, smiling woman who put her instantly at ease, probed her stress levels and asked about recent traumas.

Lissa couldn't cite anything but the argument with Ken over the article. It hardly ranked as a trauma, but it still rankled.

"You've never argued with your husband over a piece of work before?"

Lissa shrugged. "Certainly. But he's never condemned anything I've done out-of-hand before."

"Is that what you feel he's done—condemned you out-of-hand?"

"Me? No, he wasn't condemning *me,* just the article."

"You said he called you a fanatic."

"He claims he didn't. He says he yawned or hiccuped something and I heard what I expected to hear."

"What do you think of that?"

"I think he called me a fanatic and then felt guilty about it."

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"Do you think he was right?"

"You mean, am I a fanatic? No. Of course not. No more than he is. I'm just committed to the scientific paradigm."

The doctor made a few notes, then asked, "What about past traumas? Childhood traumas, for example?"

"Like what?"

"The death of a loved one. A terrifying personal experience."

Lissa shrugged, trying to relax suddenly tense shoulders. "No more than anyone else. I . . . fell out of a tree once and broke my arm. My father died when I was twelve."

The doctor was reading her face. "You attach no particular significance to these events?"

She did, as it happened, but shook her head. She had fallen out of the tree into the swirling waters of a rain-swollen river. She had been in the tree because the plane she was riding in crashed into the South Platte. Her father had died in that crash.

She wondered why she was withholding from Dr. Van Owen even the fact that the two events were related; but wondered only fleetingly. She was being contrary because it was her nature to be contrary. She didn't like people digging around inside her—resented the idea that a stranger might know things about her she did not know about herself. She was not convinced, she realized, that the beads and rattles used by modern psychiatrists worked any better than the ones used by their more primitive forebears.

Dr. Van Owen veered from the discussion of PTD onto a completely unexpected tack. "Your description of floating or soaring through the ceiling of your room, the vividness of the detail you remember, none of this is consistent with sleepwalking. It *is* consistent with lucid dreaming or a classic out-of-body experience."

"A—a what?"

Van Owen raised her hands. "Not that I'm advancing that as a diagnosis, but you might want to see someone who'll at least consider it within the realm of possibility. I have a colleague—a Dr. Genoa—"

"Oh, you've got to be kidding."

"You've heard of her?"

"Only too often. I'm sorry, Dr. Van Owen. I can't take the woman seriously."

"She's a brilliant therapist."

"And a promoter of pseudo-science."

Van Owen gave her a long, steady look. "Well, you may have a point. Obviously you're not comfortable with that approach. That's fine. If you're willing, we'll just continue on and see what we can do."

That wasn't much. Dr. Van Owen seemed to know Lissa was holding back and Lissa, knowing that to be true, was distracted to the point of impatience. She was relieved when the session was over, and did not make another appointment.

The weekend found Lissa high on relief. For whatever reason, after her visit to Dr. Van Owen, she ceased having the vivid dreams. After two nights of uninterrupted sleep, she was nearly giddy and ready for a night out on the town.

Saturday evening they dined at the Equinox and strolled the Embarcadero. Oddly, the visit to the Amsted

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Gallery took some urging on Lissa's part. Normally, Ken was eager to share his colleagues' moments of pride and triumph. This time he was noticeably reluctant.

They arrived at the Amsted and were met just inside by an effusive Terri Mendez. While she engaged Ken in conversation, Lissa wandered the gallery walls, gazing at her cousin's photographs. Pastorals and portraits, alike, centered on the people. The people had engaging eyes and shy smiles. They were old and young, radiant, callused. Their faces spoke volumes about the nature of life in places far from cosmopolitan San Francisco—places Lissa had never heard of.

She entered a cubicle dedicated to the photographer's excursion through the wilds of Mongolia and found herself face to face with a culture that was a curious mosaic of Native American and Asian. Peculiar music accompanied the exhibit; drums, voices, and eerie flutes.

Fascinated, Lissa moved from frame to frame, reading about the culture of an unknown people; women who worked from dawn to dusk at every task imaginable, men who trained their throats to whistle dual tones.

That's what I'm hearing, she realized, and paused to study a photograph of the choir. The only instruments were drums; all other music was performed with voice and the strange split tones the Tuvali men produced in their throats.

She shook her head in amazement and turned to view another photo. In it, a group of young men danced the funky chicken.

Lissa's heart clenched, cold, in her chest. She knew this picture. She knew each face—the young man with the bashful smile whose loincloth was too big by half; the old woman with the gap-grin; the dignified village elder seated before his striped, multi-hued yurt. She knew each standing stone, too, and every carved design.

Her memory at once seized on a distant, waking dream, but reason denied that tenuous connection. *Déjà vu.*

Why then, the certainty that somewhere in this room was a photograph of a shamanist ritual—that amid the pounding of drums, feet, and hearts sat a man who was both shaman and Buddhist monk, a man whose face she knew to its last chiseled line? The image conjured, she moved her eyes along the linen-covered walls until the picture in her mind's eyes found a match. A *perfect* match. Down to the last long feather in the crown of the shaman's ornate headdress; down to the gleaming gold cap in his upper row of teeth; down to the eagle's-head drum mallet with which he beat his painted drum. *Horse*, said Lissa's insistent memory. *He'd call it a horse.*

Her heart steadied. "This is ridiculous."

"There you are!" Ken's voice sounded strained.

No, she just imagined it because *she* was strained.

"What's the matter, honey? You look like you've seen a non-existent earthbound spirit."

She didn't laugh at the joke. "These photos . . . I've seen them before."

"How could you? This is Naomi's

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first exhibit since she came back from the Russias."

"Well, I must have seen them on TV, then, or in a magazine."

Terri Mendez entered the cubicle in the company of a taller, dark-haired woman with a tanned face. Lissa all but leapt at her.

"You're the photographer?"

The tall woman smiled, nodding. "I'm Naomi Whitehorse, yes."

Lissa returned the smile, dry lips sticking to her teeth. "My husband and I were just debating what magazine we've seen these photos in."

Naomi glanced at her cousin. "None yet, I hope. I'm due to have a spread in *Smithsonian* next month, but nothing before that."

"Oh, well I suppose it must have been on TV then."

Naomi shook her head. "I haven't had any television coverage . . . yet," she added, crossing her fingers. "I did do a radio interview several weeks ago, though."

Ken was nodding, "I remember that. It aired on Fresh Art—the morning show."

Lissa remembered too, then. *Really* remembered. The foggy dream voices, the vivid dream images. "I'm . . . positive it had to be a visual medium. I'd swear I've *seen* these photos before."

Naomi Whitehorse shrugged. "I'm sorry, but that's impossible. I've only done the one radio interview since I came home. There were some newspaper stories on the opening, but no photos were shown."

"She described the photographs though," Terri offered.

"Yes. Yes, between the moderator and I, we described these two in some detail." Naomi indicated the wrestlers and the shaman.

Lissa felt a surge of relief. "Oh, of course, I remember now. I was just waking up. You described them in such vivid detail—the-the images on the standing stones; the shaman with the gold tooth, drumming away on his horse." She was gabbling and she knew it, but the passing of that horrible moment of weirdness was worth the minor embarrassment.

Naomi's eyes lit up. "Oh, you know something about the Tannu Tuva culture, then. Most people would have called that a tom-tom."

Lissa was confused. "I've never heard of Tannu Tuva. *You* called it a horse during the interview."

Naomi gave her cousin another glance. *What's wrong with this woman?* it whispered. "No," she said, "I didn't. In fact, I didn't describe it at all. I described the dancers in great detail. But I *know* I never used that terminology to describe the shaman's drum."

"You did describe the shaman, though; his headdress, his gold tooth—"

Naomi Whitehorse was staring at her now. "Honestly, I *never* described him in that detail."

"But I *saw*—" Lissa swallowed. She sounded so desperate. Three pairs of eyes were on her like hot little spotlights. "I realize how silly this sounds."

Naomi shook her head. "Not at all. I'm a firm believer in the mysteries of the human spirit. You must have

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heard the broadcast and somehow visualized what I was seeing as I described the photos. Have you had that sort of psychic experience before?"

"Psychic experience?" Lissa tried to laugh and choked instead. "That's absurd."

"Is it?" countered Naomi. "Why?"

"I'm not allowed to have psychic experiences, I'm a skeptic."

"A skeptic?" Naomi echoed. "About what, exactly?"

"About all this: psychic experiences, magic, the mystical."

Naomi's expression went from warm to chill. "My Tuvali friends would argue the reasonableness of that skepticism. They live their lives surrounded by the mystical—as did my ancestors."

That observation ended the conversation. Terri Mendez swept her cousin away with nervous glances at Ken, while Lissa, hot-faced, made her way to the buffet table.

"You probably think I'm going nuts," she murmured to Ken over hors d'oeuvres.

"No."

"It's just a vivid imagination coupled with exhaustion."

"Is that what Dr. Van Owen thought it was? Her office left a message for you at home, asking if you wanted to make another appointment. What's this all about, Lissa? Is it the sleepwalking?"

"That and some other stuff." She told him then, about the weird bouts of déjà vu that seemed to occur with increasing regularity. "I'm thinking someone is going to say something and in the next second, the words pop out of their mouths."

"Or not, as the case may be?" He was looking into his punch glass, not at her face.

"What?"

"You've always accused me of saying aloud what I was only thinking. But lately, it seems to happen all the time."

She stared at him, trying to peek beneath the veil of caution that covered his face. "Always? I've *always* done that?"

He nodded, a smile lifting the corner of his mouth. "When we met, I thought it was cute. Special, like we were on the same wavelength. I've always liked it. Sometimes I know what you're thinking, too. Proximity effect, I suppose."

"Ken, that's absurd. It's irrational and it's unscientific."

He shrugged. "So's human attraction. I'm not going to knock it, though. It brought a balding, nerdy guy together with a hot young journalism major. I should argue?"

He was trying to jolly her. She appreciated and resented it simultaneously. "How can you joke about it? How can you . . . court such irrational beliefs?"

"What beliefs, Lissa? They're not beliefs, they're observations."

Lissa put her glass down before her shaking hands could spill its contents. "Maybe I'm going crazy."

"Nonsense. What did Dr. Van Owen say?"

"She was leaning toward post traumatic stress disorder, brought on by childhood trauma, I'm pretty sure."

"Your father's death? The plane crash?"

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Bingo. "I . . . I didn't tell her about that."

"Why ever not?"

"Just being perverse, I guess. And private. She said my dreams sounded to her like a—quote: classic out-of-body experience—unquote. She wanted to refer me to—you're not going to believe this—your friend, Dr. Genoa."

"You could do worse. Maybe you *should* see her."

"Absolutely not. The woman stands for everything I despise—irrationality, pseudo-science, mysticism."

"Why do you despise it?"

She stared at him. "How can you ask that? I thought we were involved in the same crusade."

He set down his punch. "Do you hear yourself, Lissa? 'Despise,' 'crusade.' Those are words from a zealot's vocabulary. I'm not sure they should be in a skeptic's."

"What words do you recommend I replace them with?"

" 'Doubt,' maybe. 'Question.' And I've always felt we were involved in more of a *quest* than a crusade. A search for reality, but a search in which we try not to indulge fond, superstitious fantasies about the outcome."

"I don't do that," Lissa denied. "I'm not superstitious and I don't indulge in fantasy."

"You don't? You had no foregone conclusions about what your NDE investigation would reveal? You had no prejudice about the veracity of Julie Pascale's experience?"

She could not swear to that, and knew it, but attempted to anyway. "No. I had no preconceptions about Julie Pascale. I didn't label her a fraud. She might have been the victim of hallucinations, or delusion; she might have experienced the perfectly explainable effects of what happens when a brain shuts down for forty-five minutes then . . . reboots. Or she might have been dreaming."

"Like you've been doing?"

"I . . . I suppose."

"But she couldn't really have passed into the next world and returned."

"She was on a gurney in ER."

"Don't be obtuse. 'Her,' meaning her soul or spirit or whatever you want to call it. You don't believe a spiritual state after death is a possibility, hence you conclude, at the outset, that her story is false."

"Yes."

"That's prejudice, Lissa. You don't see her story as evidence for a possible reality that we simply haven't plumbed yet. You see it as a lie to be debunked. Prejudice."

"Rationality."

"Bull shit."

She did not sleep well. The photographs returned to haunt her and came to vivid, waking life. At some point, she began to have another of the flotation dreams, but rode it only as far as the ridgepole before forcing the dream to suck her out of the ether and back to bed.

Sunday night was no better. Monday morning she called Petra Genoa's office.

"May I ask what this is in regard to?" asked the young man who answered her call.

"I, ah, it has to do with a case Dr. Genoa was involved in some years

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ago. A young woman named Julie Pascale had a near-death experience. Dr. Genoa was her therapist. Julie recommended I interview Dr. Genoa as part of my investigation."

Genoa surprised her by seeing her that afternoon. She surprised her further by being an attractive young woman in a dashiki suit and musically trimmed dreadlocks. The suit was topped with an open white lab coat.

"Are you a medical doctor too?" Lissa asked, shaking the other woman's strong, tapered hand. (Gold fingernails.)

"Oh, no. They just like their professors to look professorial. Since my taste in attire runs to the, ah, individual, they've asked that I retain the coat." She tilted her pocket name plate up and glanced at it. "Well, at least I can't forget my own name."

Seated in Professor Genoa's sunny office, Lissa was caught up in the anticipatory tingle of journalistic nerves. She lived for that sensation. It peaked as she slipped her notebook into Record Audio mode and readied her first question. If there was a heaven, Lissa thought, fleetingly, it was this moment—perpetual interview.

LS: How clear are your memories of the events surrounding Julie Pascale's near-drowning?

PG: Crystal clear.

LS: This was eight years ago. I have trouble recalling what happened eight *days* ago.

PG: This was an event that wrought major changes in my life. I'm not likely to forget it.

LS: Were you on duty when Julie Pascale was brought in?

PG: I was just coming off duty. I got waylaid in the hall and asked if I could counsel the family of a drowning victim. I was told they were still trying to revive the girl but that her chances were slim. I got to the Emergency Room just as Dr. Mead pronounced Julie dead.

LS: Then you overheard the altercation between Drs. Mead and Harris?

PG: Yes.

LS: And how close was Julie Pascale's recollection of the confrontation?

PG: Nearly perfect. You said you interviewed Dr. Harris; I'm sure he told you as much.

LS: Why is it necessary to attribute that to a supernatural cause? Couldn't Julie have overheard, say, a couple of nurses or interns discussing the events in ER as she was coming around in ICU?

PG: Ms. Shaw, we've all been party to conversations that attempted to describe other conversations. How often is the format of such a dialogue "he said-she said" interspersed with verbatim quotes? One thing Julie Pascale demonstrably possesses is an eidetic memory. I have to at least entertain the idea that she heard an actual conversation, saw facial expressions, observed actions no second-hand conversation would have detailed, even if it *had* been carried on within her hearing.

LS: Then she must have been conscious or semi-conscious in the ER.

PG: Well, her heart had stopped and her brain waves were nil; neither sight nor sound was getting through to her. She had, in fact, been declared dead by a highly respected cardiac

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specialist. Even if she had been capable of opening her eyes, she accurately described things her physical vantage point on the gurney would not have revealed.

LS: For example . . .

PG: The fact that the nurse attending Dr. Harris originally picked up the wrong IV, noticed it and returned it for the appropriate solution. The fact that her Brain Pattern Monitor was showing nothing but failing Beta waves.

LS: She might have overheard the nurse tell someone she almost brought the wrong solution; someone might have told her—

PG: But they *didn't* tell her. I interviewed that nurse—Evelyn Yamaguchi. When I told her what Julie claimed to have seen, she was shocked and ashamed. She'd never told anyone about the mix-up. She was just thankful she caught her mistake before Julie was harmed. It wasn't something she was proud of.

LS: Then someone else must have seen her.

PG: Someone did; Julie Pascale.

LS: That's impossible.

PG: Is it? You're obviously convinced it is. A moment ago you asked why it was necessary to attribute this to supernatural causes. I don't think they *are* supernatural. I think, because these things happen, they must be completely natural. How can any of us—except maybe a Julie Pascale—claim to have even an inkling about what happens after death, or during sleep, or in any other altered state of consciousness? From the perspective of twins during the birth process, the firstborn is dead, gone, unreachable. Neither could realize, until they reach the outside world, that there's more to life than the womb.

LS: So this is a womb-world and we're all headed for Julie Pascale's raft of love?

PG: Let me ask you a question: Why do you so adamantly refute Julie's experience?

LS: I'm not refuting it. I'm investigating it.

PG: No, you're trying to attribute it to something *you* can comprehend. Maybe it's incomprehensible . . . for the time being.

LS: Oh, I see. It's what the Catholic Church refers to as a "mystery."

PG: I'm not Catholic, but it's what *I* refer to as a mystery. I'm not saying we'll never understand it, just that we don't *now* understand it. The child in the womb doesn't have a clue about why she needs eyes. She probably doesn't realize she has them. She certainly couldn't grasp the concept of *seeing*, let alone the reality of it.

LS: So you do believe this is a womb-world and that we're—what—carrying eyes we don't know we have, couldn't know if we wanted to, and won't use until we die?

PG: Could be. Could be that rare individuals like Julie get their eyes opened a bit. It's an interesting mystery, don't you think?

LS: And you're content with that?

PG: (laughing) Do I have a choice? The science fiction writer, Philip K. Dick, said, "We should be content with the mysterious, the meaningless, the contradictory, the hostile and, most of all, the unexplainably warm and giving. . . ."

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LS: A lovely quote, but don't you want the mystery explained? Don't you want to be able to comprehend Julie Pascale's experiences . . . and your own?
PG: Certainly. But I don't have an agenda that demands it be explained in a particular way. I'm content with the mysterious, but that doesn't mean I don't want to clear up the mystery. Really, the whole process fascinates me.
LS: Hence, your involvement with parapsychology.
PG: The term "parapsychology" has a decidedly negative connotation. You'll understand if I avoid using it. I'd like to be able to coin a more accurate term, but I'm not much good at PR
LS: But you are good, I'm told, at studying unusual phenomena. Just out of curiosity, I'd like to see what you make of . . . some experiences I've had over the last couple of months.
PG: OK. I'm game.

Lissa leaned forward to flip her notebook out of record mode. She wanted this completely off the record. "I've been having dreams," she said. "Dreams wherein I seem to be floating out of my bedroom, out of my house, sometimes out of my neighborhood. Four or five times I've seen things happening outside my house that I later find out have actually occurred. For example, my across-the-street neighbor's house was tee-peed by a bunch of high school kids. I saw it in my dream—right down to the faces of the kids who did it and the car they were driving. The next morning I saw the house had actually been tee-peed. What could that have been?"

Dr. Genoa's eyebrows raised delicately. "I'd say sleepwalking, but somnambulists rarely, if ever, recall their wanderings—let alone in that detail."

"Rarely. But not 'never'?"

Genoa nodded. "The sensation of floating—"

"Now that sounds similar to what Julie Pascale described, doesn't it?"

The dark brows scooted higher. "That was a near-death experience. You weren't dying."

"Exactly. I was merely asleep. But you don't think I'm sleepwalking."

Genoa shrugged. "It could be lucid dreaming."

"Could you define lucid dreaming for me? I want to make sure we're on the same page."

"Lucid dreaming takes place in the middle of REM sleep—it differs from sleepwalking in that major respect. Lucid dreams usually occur in the early morning and are marked by unusual lucidity, clarity of thought, the awareness that we are dreaming, an ability to direct the action in the dream."

Lissa considered that momentarily. "I *was* directing the action somewhat. I was amused that my neighbor's house was under attack by boys armed with toilet paper and I consciously moved in for a closer look."

"Then what happened?"

"The neighbors woke up, the boys drove off, I was sucked back . . . um, into another dream."

"Sounds like lucid dreaming, except for one important detail; what you saw *really happened*."

Lissa toyed with the strap of her notebook. "My . . . a psychiatrist I interviewed said it sounded like a classic out-of-body experience."

"Known in the vernacular as an

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OBE. Uh-huh. We don't know that OBEs and lucid dreams aren't related phenomena. In some people, they seem to be practically interchangeable."

"Yes, but lucid dreams are in the realm of accepted psychology. Out-of-body experiences are psychic supposition."

"As recently as 1990 lucid dreaming was lumped in with all that New Age jazz by skeptics and true believers alike. The 'give-me-a-break' fantasy of last week often becomes the 'gee-wow' science fiction of yesterday on its way to becoming established theory."

"I could have sleepwalked, gone to the window—or even out onto the lawn—then experienced the floating sensation as I woke up to see the boys teepee the house."

"I suppose. But you didn't wake up in the street, did you?"

"No. But I could have slipped back into sleep and sleepwalked myself back to bed . . . couldn't I?"

"I've never heard of that happening . . . which doesn't mean it couldn't or didn't happen to you."

"Alright. Let me describe another lucid dream. The morning radio show I wake up to was conducting an interview with a photographer who'd just come back from Tannu Tuva. She . . . described a couple of photos—generally, not much detail. My mind filled in the details; a gold cap on a shaman's tooth, the images on some standing-stones. I'd all but forgotten the dream when Ken and I went to her exhibition. The photographs I saw fit the details I dreamed right down to the pattern on the head of the shaman's drum. Needless to say, I was a little rattled."

"Yes, I know. Ken . . . told me about it.

Lissa dropped the notebook strap. Hair stood up on the back of her neck. "He what? Would you mind telling me why Ken was discussing me with you?"

"When he spoke to me about becoming a monitor for my project, I had a strong impression that you were headed for some sort of disturbing experience related to a visit to an art gallery."

"I don't believe you."

Genoa shrugged. "Your prerogative, certainly, but Ken did record my statement."

"How long ago?"

"Three weeks or thereabouts. . . . That was really what you came here for, wasn't it? To try to understand what happened to you." She shook her head, dreadlocks singing. "I'm sorry, Lissa. But I don't fully understand, myself. If I did, I wouldn't feel impelled to seek out people like Julie Pascale. I wouldn't be up to my ears in this project. And I'd be able to give you answers. Instead, all I can do is invite you to join in asking the questions. Maybe we can work toward comprehension together."

She rejected the invitation (out-of-hand, Ken would have said). She went for a long drive up through Sausalito and Tiburon. She sat on Stinson's Beach and stared at the randomness of waves and thought about her father and plane crashes and endings.

Finally, she went home.

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"I was worried," Ken said.

"So was I."

He gave her his patented over-the-ghost-glasses look.

"I saw Petra Genoa this afternoon. We talked about NDEs and lucid dreams and OBEs . . . and photo exhibits."

"Oh," he said. Just, "Oh."

"Can I hear what she said about the art gallery?"

"Are you sure?"

"No. Can I hear it?"

He got out his notebook and set it up on the coffee table. "Are you sure?" he asked again.

She took a deep breath. "Yes," this time.

He opened the file and fast-forwarded to a bookmark he'd set at Genoa's prediction. On the flat screen, Petra Genoa's attractive face wore an expression of bemused concern.

"Ken," she said, "are you ready to start your job as monitor?"

"Sure . . . I guess. Why?

"Your wife is going to experience some sort of trauma."

"What? Emotional or physical?"

"Emotional . . . Art gallery. I had a sudden impression of an art gallery or museum or exhibition maybe. Paintings . . . no, photos."

"When?"

She shook her head, making music. "I don't know. I rarely know, exactly. Usually my range tops out at about three months. Can you save this conversation to a file?"

"Can you be more specific about the nature of the trauma?"

"Fear. I know she'll be frightened. I don't know why."

Lissa was nodding. "She does now."

"You were frightened because you saw the photographs in a dream before you *saw* them in reality."

"Yeah. I dream orange fabric on our roof; there's a kite stuck to the chimney. I dream the neighbor's house is tee-peed; it happens. I see a shaman with a gold tooth; Naomi Whitehorse has taken his picture. Dammit, Ken," she complained, "these can't be psychic experiences. I'm a skeptic."

"Fine. Be a skeptic. Look for answers."

"I've *been* looking. My psychiatrist doesn't have a clue. She wants me to meditate. Dr. Genoa doesn't have a clue either, and she wants me to help her look for one." She fidgeted. "She quoted some science fiction writer at me: Be content with the mysterious, he said."

"Philip K. Dick. Yeah."

"That's hard for me, Kenny." She thought of Julie Pascale. "Damn, it's even hard for me to be content with the 'unexplainably warm and giving.' How do you do it?"

He shrugged. "I just try to keep an open mind. Look for truth wherever it may rear its often peculiar head."

"Even in Petra Genoa's camp?"

"Yeah, even there."

"OK. I'll think about it. Right now, I've got an article to rewrite."

"Oh? Which one?"

"The Pascale NDE. I'm not saying I believe she went beyond the Great Divide, but I realize I reported with bias. OK, *prejudice*. My approach to her interview was skewed because of it. I wasn't looking for truth, I was trying to satisfy myself that there are no mys-

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teries I can't personally unravel."

"So what approach, now?"

Lissa shrugged, trying for a grin. "It's a mystery."

Ken smiled, bending over to kiss her as he rose.

"Where are you going?"

"To remove the kite from our roof." He paused, giving her a cockeyed look. "Is there anything in the rain gutters I should know about?"

"No, but there's a chubby old guy stuck in our chimney."

They both laughed. She felt—not lighthearted—but better. "Content with the mysterious"—she would try to be that, hard as it was.

She heard Ken's footsteps overhead. A moment later, a wad of orange polyurethane sailed past the living room window.

Oh, Mr. Dick, you said a mouthful.■

IN TIMES TO COME

Our November issue features two very different novelettes by two *Analog* favorites, Grey Rollins and Amy Bechtel, and short stories by Arlan Andrews and Jeffery D. Kooistra. The subject matter ranges from the very near and soon to the farthest reaches of time and space—in at least one case within the same story!

Richard Meisner returns to our science fact section with another of his unorthodox speculations on cosmology. A few years ago he created quite a stir with an article considering whether the Universe might be "the ultimate artifact." Next month he offers the flip side in "Cosmological Darwinism." Might universes arise by a process of reproduction, complete with evolution by mutation and natural selection?

Last but by no means least, we'll have Part Two of Frederik Pohl's serial "O Pioneer!", rounding out an issue with a wide range of fascinations.

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Spares, Michael Marshall Smith, Bantam, $22.95, 321 pp. (ISBN: 0-553-10604-X).
Rewind, Terry England, Avon, $5.99, 343 pp. (ISBN: 0-380-78696-6).
An Exchange of Hostages, Susan R. Matthews, Avon, $5.99, 372 pp. (ISBN: 0-380-78913-2).
Dragonseye, Anne McCaffrey, Ballantine/Del Rey, $24, 355 pp. (ISBN: 0-345-38821-6).
Ignition, Kevin J. Anderson and Doug Beason, Forge (TOR), $23.95, 320 pp. (ISBN: 0-312-86270-9).
"Sexuality and Cyberspace," **Women & Performance: A Journal of Feminist Theory,** Vol. 9, No. 1, Issue 17, Theresa M. Senft and Stacy Horn, eds., $9 (one-year, two-issue subscriptions, $14 for individuals, $25 for institutions), New York University, Tisch School of the Arts, 721 Broadway, 6th Floor, New York, NY 10003 (http://www.ech onyc.com/~women/) (ISSN: 0740-770X).
Outposts: Literatures of Milieux (I.O. Evans Studies in the Philosophy and Criticism of Literature, No. 28), Algis Budrys, Borgo Press (P.O. Box 2845, San Bernardino, CA 92406-2845, 909-884-5813), 144 pp., $29 cloth (ISBN: 0-89370-347-8), $19 paper (ISBN: 0-89370-447-4).
The Work of Stephen King: An Annotated Bibliography & Guide, Michael R. Collings, Borgo Press (P.O. Box 2845, San Bernardino, CA 92406-2845, 909-884-5813), 480 pp., $51 cloth (ISBN: 0-8095-0520-7), $41 paper (ISBN: 0-8095-1520-2).

Michael Marshall Smith and Bantam could not have timed the publication of his novel, **Spares**, any better if they had had a crystal ball with a hot-line to spring 1997's headlines.

The review copy landed in my mailbox within days of the announcement that Scottish researchers had successfully cloned a mammal—a sheep, with a warm fuzzy lamb for the photo ops. Ethicists promptly went, "Oh! Horrors! Think of the awful things we can do now! Why, rich folks might clone themselves and then carve up their clones for spare parts! Ban it right away!"

All the shock and amazement out there in media land seems a bit disingenuous, for this isn't exactly a new idea. SF has played with it for decades, and my very first column here (October 1978) was devoted to David Rorvik's *In His Image: The*

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Cloning of a Man. And banning the technology is a bad idea for two reasons: first, the cat is out of the bag already; *someone* is bound to refine and use cloning; second, banning it seems likely to mean blocking the development of a means of growing replacement organs *in situ*. (Is your heart failing? Got a few months left? Then here, take this shot, and as soon as the new heart is big enough we'll just snip out the old, or maybe give you another shot that just dissolves the old.)

Be that as it may, *Spares* is one heck of a topical novel. In fact, they can't get much *more* topical! So its success is assured, and the movie in the works seems likely to make a splash as well.

But—is it any good?

And please whisper this answer: No.

The problem is that it is a jumble of science fiction and fantasy flooded with drugs and gratuitous gore. Kids'll love it. Grown-ups won't.

Here's the story: Jack Randall was a cop in an exceedingly corrupt city, dedicated to rooting out some of the worst nastiness until someone slaughtered his wife and daughter. He promptly dropped into total drug-fugue funk until he wound up as the caretaker in a "Farm," blue-lit tunnels packed with mindless, uneducated humans variously missing fingers, limbs, eyes, and so on. Those spares, you see.

As his sense of decency returns, Jack tries to save the situation by teaching the spares to speak and read, to be people. But when the surgeons arrive one day to carve up one of his charges, and that charge says, "Please, don't," (why waste anesthesia on meat?) the fit hits the proverbial shan and Jack is on the run with half a dozen of his best trainee humans in tow.

He loses them pretty promptly, along with several friends, dives back into the urban fray, and discovers that the war he once survived is still affecting his life. That war, however, took place in The Gap, apparently a sort of consensual hallucination metaphorizing the gaps between people, flowing from ambiguities in communication, including computer code, and accessible only by following cats.

Right. This is where the science fiction and the fantasy get jumbled. Meanwhile the body count is rising, Jack's mind is rotting out under the influence of drugs and alcohol, and the villain is looking pretty obvious.

The spares? They got lost early on, remember? They get mentioned again just enough to associate them with utter wickedness, which seems after all to be the current PC line.

Too bad. If that's the line that wins, we're going to lose something valuable.

Terry England's **Rewind** is a nice piece of work, both thoughtful and entertaining. It begins with an alien spaceship set down in New Mexico and surrounded by the world's biggest huckster room. The ETs can't breathe our air, but they're quite cordial, willing to tell all about themselves (if we but ask the right questions) and eager to learn everything they can about us. They've even turned part of their lander into a mu-

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seum of sorts into which anyone can walk, and many do.

One day, six years after the landing, the museum door closes behind seventeen visitors—nine men (one of them a refugee from a nursing home), eight women. A few days later, the ship takes off and seventeen children—nine boys, eight girls—are found nearby, adult clothes stacked beside them, and each one claiming the name, memory, and identity of one of the missing seventeen adults.

What is going on? Good question, and the government wants to know right away, if not sooner. Enter a task force of scientists; a horde of media reporters as excited as a cat in a catnip jungle; a host of bureaucrats who want the fuss to die down and stop distracting media attention from the presidential campaign; several loons who insist these "kids" can't possibly be real human beings and must be aliens, agents of an alien conspiracy to conquer the Earth; and a begat of religious nuts who proclaim these "kids" as the devil's spawn—after all, rewinding the biological clock isn't natural and it can't possibly be divinely sanctioned—and issue mealy-mouthed *fatwahs*.

And let's not forget the lawyers and judges who decide that even though the seventeen have the memories of adults, they look like kids and therefore must be stripped of their vote, jobs, bank accounts, property, and every other vestige of human rights. Indeed, since they look like kids, they really must be in adult custody. As soon as the medics are done examining them, it's off to spouses, parents, sisters, some of whom simply can't deal with the situation and some of whom succumb to greed, literally selling the "kids" to unscrupulous characters who want lots of blood samples. It's not long before six of the "kids" are dead.

You get the picture, I'm sure. Human assholery run rampant. But the howling loons are by no means everywhere. Some people can see reality instead of image, can think for themselves instead of running on demagoguery. So Earl Othberg is getting along pretty well with family (though the neighbors are a bit of a problem). Aaron (who used to own a Maserati) and Marian have escaped to the shelter of a homeless enclave. And the task force is still in there pitching.

Of course, everything works out tolerably well, at least for Earl, Aaron, and Marian, on whom England has kept our attention throughout. The final question is why the aliens did what they did, but I won't answer it except by noting England's hint that prolonged (or repeated) childhood is beneficial to an intelligent species. Grow up and learn, and then take what you have learned and grow up again. The ultimate solution to "Ve grow too soon oldt, und too late schmardt."

Avon seems to be going all out with special press releases and reviewers' editions of Susan R. Matthews's **An Exchange of Hostages**, and to a large extent the fuss is justified. Matthews is both very good and relatively original, which guarantees that she will stand out in a field dominated (in numbers if not stature) by

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mediocre imitators. And her photo does *not* look like a picture of someone whose work can prompt one blurber to suggest that she be kept away from sharp objects.

Hostages supposes a future so distant that humanity is split into subspecies. Yet human nature remains much the same: we are still capable of empathy and love and remarkable viciousness. Indeed, civilization is ruled by the Jurisdiction, an autocracy that believes any and all offenses against law and order are to be punished with the most excruciating torture imaginable. The ships of the Fleet each carry Ship's Surgeons who have followed their medical education with a quick course in how and when to cause various degrees of suffering, up to and including death in prolonged agony. The tools are classic, traditional whips and pincers, clubs and blades, as if no one had ever studied the sadistics of electricity or direct neural stimulation. Blood and gore, the crushing of body as well as will, are the point.

And the Ship's Surgeons are also called Inquisitors. The echo of the Spanish Inquisition is quite unmistakable.

Now meet Andrej Kosciusko, heir to a noble realm, honors graduate of a tip-top medical school, rebellious against the family order but bowed enough to go to the torturers' school. He must learn to inflict horror despite a profound respect for personhood, profound empathy, a powerful commitment to healing, and the physician's classic oath to do no harm. Since most student Inquisitors have a rather different orientation, he soon gains the admiration and loyalty of his bond-slave, as well as others. His fellow student, Mergau Noycannir, is there only to learn how to dominate; to her, empathy and compassion and even simple politeness are signs of weakness. She sees nothing else. Someone like Kosciusko is meant to be used, never respected.

Kosciusko astonishes himself when he discovers that he can love giving pain. But he astonishes his teachers even more when he demonstrates that empathy can be a powerful tool for prying information out of reluctant prisoners. They cannot dream of letting him go, even when the school's medic expresses a wish that he be given to her for his medical skills. He must Inquire, and if that means that he surrender his honor, so be it. In exchange, he can have a man's life.

Is that enough? Surely not, for *Hostages* ends on a note that clearly promises a sequel even though nothing in press releases or blurbs makes the promise more explicit than "She is working on her second novel, to be released by Avon in 1998."

Do you want this one? The torturing is pretty explicit, but if your stomach can stand it, I think you'll find it a very satisfying experience.

If you are a fan of Anne McCaffrey's Dragons of Pern series, you will love **Dragonseye**. The series is thirty years old now (it began with "Weyr Search," *Analog*, October 1967), and it has gone through ten books concerning the world of Pern, whose human colonists discovered too late that

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it was visited every 250 years by a rogue planet that caused a fifty-year rain of fungoid (if that's what McCaffrey means by "mycorrhizal") "thread" that devours everything organic. In response, the colonists genetically engineered local "fire lizards" into giant flying, teleporting dragons that could breathe fire to destroy thread and constructed a society around the need to maintain the flocks and their riders. Not surprisingly, the colonists also lost all memory of their origins, including all pre-Pern technology.

The result was a fascinating world and culture that enchanted a great many readers and enticed McCaffrey into elaborations. She gave the dragons time travel, discovered the colonists' original landing site, developed the culture's history, and so on. And nary a reader cried, "Nay, enough!" though perhaps they should have. Some of the books have been quite slight.

Is *Dragonseye*? Well, yes, though it does have charms. The tale's time is the colonists' second encounter with the rogue planet. The dragons have been bred to useful size (though they are not yet as big as they will be centuries later). The rules of survival, so painfully learned 250 years before, have been codified. Now looms their first test, even as one venal Holder (lord of a manor) refuses to prepare; the computers, last remnants of the colonists' technology, totter and fail; teachers debate how much of the pre-Pern past to abandon in the name of relevance; singers invent folk-songs that will successfully carry basic knowledge across the centuries; and folk struggle to invent the Eye Rocks that will warn that a Pass of the rogue planet is nigh.

However, anyone who has read even one of the previous Pern books knows that every one of these problems is solved. *Dragonseye* is thus a footnote book, filling in minor details for the applause of the fans while the rest of us say something like, "Eh?"

It's not science fiction, but what the heck. It's got astronauts with all the right stuff, the space shuttle *Atlantis*, and plenty of derring-do, it's already on the Hollywood fast-track, and the authors are familiar to *Analog* readers. You'll love it.

It's Kevin J. Anderson's and Doug Beason's **Ignition**. The basic gimmick is simple: "Mr. Phillips" has assembled a team to destroy a Chinese Long March launch and a French Ariane launch, just to establish sufficient bona fides to be believed when he shows up at Cape Canaveral. He's a cold New England fish who believes in precision planning; his motive is ransom; his methods are brutally, murderously effective; and he and his henchmen and woman are slimeballs supreme to the point of cliché.

Now meet shuttle commander "Iceberg" Friese. He broke his foot showing off for reporters, and now he's off the mission. But he will, by damn, have a good view. He's sneaking in the back gate to camp out in the palmetto scrub. And right behind, all unsuspected, come Mr. Phillips and his friends, murdering gate guards, planting a bomb on top of the shuttle's external tank, and so on.

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It doesn't take long for Iceberg to realize something is amiss and begin to take steps. After all, that's *his* crew sitting on top of the bomb, even if someone else does have charge for the moment. And he isn't about to let the terrorists' ample supply of guns, missiles, bombs, and such intimidate him. Nor will his sore foot stop him, though the Donkey Kong chase through the Vehicle Assembly Building, culminating in a spectacular fire, does leave it a bit the worse for wear.

You get the idea. It's a Rambo ramble all the way to a bang-up ending. It maintains its momentum all the way, without a single serious misstep.

And if it's about as plausible as an accurate psychic, well, it's still much more believable than *Spares*. It's lots of fun, too.

The "Sexuality and Cyberspace" issue of **Women & Performance: A Journal of Feminist Theory** is in many ways quite interesting. I am no feminist theorist, so much of the jargon whizzes past me very rapidly, but there is a strong tendency to think in postmodernist, deconstructionist terms. To a hard-headed scientist type such as myself, this looks a lot like getting confused by and lost in metaphor ("the Net's status as a place is a [useful] metaphorical hallucination" [p. 14] where one can worry about whether one can "catch a computer virus during cybersex" [p. 13]). Yet there are genuine issues of equity and identity raised when a male-to-female transsexual tries to get into a women-only discussion group, and it certainly does not feel like a hallucination when a bonkers man stalks a woman through her professional and private Internet contacts or when another subverts a script to make female characters undergo severe abuse.

A lot of ink (and breath and electrons) has been used to proclaim that the Net is a neutral place where one's identity and gender are a matter of choice. Many of the essayists here seem to be saying that this is by no means necessarily so. The Net is an extension of ourselves, and when we use it we remain as manipulative and as vulnerable as ever. If we forget this, the inevitable reminders are a shock.

As I said, this is an interesting item. If you have Net access, you can read it for free at http://www.echonyc.com/~women/. It includes "A Feminist Yellow Pages of Cyberspace," which can lead you to numerous other Net sites.

Henceforth and forevermore, it will be impossible to discuss science fiction in any intelligent fashion if one has not read Algis Budrys's **Outposts: Literatures of Milieux**. This slim little book of five 15-20-year-old essays is so thoughtful, so insightful, so informed by long experience and keen observation, that it belongs in the hands of all who ponder the nature and purpose of science fiction—or indeed of fiction in general—as well as in every academic library.

Budrys's major concern here is what he calls the science fiction world's long and inconclusive effort to define "science fiction." He rejects the idea that science or even technology (far more often seen) is any spe-

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cial part of the true definition, for there are just too many examples of stories that lack both but all nevertheless agree are science fiction. In his long "Paradise Charted" (from *Triquarterly*, 1980), he offers us the concept of "time-binding" as central; by it he means a sense that the wider view matters, that the important parts of reality are much more than just what is under our noses, with a great deal of relevance to be gained by social extrapolation. Science fiction thus appeals, and has always appealed, to those with an unusual cast of mind, for whom Hugo Gernsback triggered "the formation of a pocket universe—an enclave inside literature, equipped with its own readers, and, in due course, its own writers" (pp. 25-26).

In "Literatures of Milieux" (*Missouri Review*, date not given), he tells us that if there is any "science" in science fiction, it is not the method of science and certainly not the substance, nor even a sort of generalized technophilia, but a willingness to question what he calls "The Consensus." In this, he comes very close to what I tell my students is the true soul of science: skepticism, insistence on checking out what one is told and what one guesses, refusal to believe any authority just because it is Authority. In science, you see, truth is defined not by fiat or by hearsay, but by demonstration. And if actual demonstration is not possible (life on other worlds), it accepts *gedanken* experiments, attempts to simulate via reason how something *would* work out if only it could be tried in fact.

This, I think, comes very close to what science fiction and fantasy are all about, as well as to what Budrys is telling us. But don't just take my word for it. Go ahead and spend a few bucks. You'll be glad you did.

Stephen King is a phenomenon. If you did not know that already, take a look at Michael R. Collings's massive **The Work of Stephen King: An Annotated Bibliography & Guide**, 480 pages of small print listing not only King's own work (with plot summaries) but also an enormous amount of critical effort, both amateur and professional (and other material, including unpublished works). Now read Collings's introduction, which he ends by assuring you that some of this book is complete "through at least 1994" but "some of the minor secondary chapters conclude with 1991." In other words, almost 500 pages of bibliography for what one of Collings's incredulous colleagues called "A *living* author?" and it's *not* complete.

A phenomenon. Right. It's no wonder King confounds the critics. As Algis Budrys has said, he's a genre all by himself. And this book will be useful to both fans and scholars. I plan to give my review copy to my college's library. ■

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BRASS TACKS

Dear Dr. Schmidt:
This is in response to your "Style and Substance" (March 1997) editorial's call for suggestions. I have an idea of how to help children someday judge presentations not by the colorfulness of their viewgraphs, but by the content of their message. I think children's educational software could be designed to teach this.

Currently, many educational games for small children have cute little talking cartoon animals to explain the puzzles that are presented. A game designed to teach objective judgment as well as problem-solving could have an array of characters—er, I mean a wide variety of cartoon figures—offering advice on how to solve the puzzles. They would range from appealing fuzzy pink bunny rabbits with perky voices who use slick graphics to show the proposed solution, to visually unappealingly creatures that mumble and insert "uh" at random intervals and use very crude graphics to get their point across. Some of them would propose correct solutions, and some incorrect, at random; there would be no correlation between the quality of the advice and the quality of the presenter and presentation. If incorrect solutions correspond to dangerous outcomes in game terms, e.g. as traps in the dead ends of a maze, then it would simultaneously teach the important safety lesson that good and bad strangers aren't as easy to tell apart as heroes and villains in a typical cartoon.

With that said, I have to add my opinion that a good presentation that communicates information quickly—something worth striving for, if time is short or the audience is large—is one that engages the highly evolved portions of the brain that can rapidly process information from color pictures, and does not rely solely on the low-bandwidth inputs such as language, let alone reading, that evolution has only recently started dabbling at. (I read somewhere in an article on AI that we take the former set of skills for granted because humans are all so good at them, whereas simple tricks that humans as a race don't excel at, like adding numbers quickly, are prized as a sign of an individual's intelligence—or were, until dumb machines were shown to be able to reproduce them.) If a presentation engages the senses and communicates the idea more quickly, the idea should then be easier to judge on its merits. It's a fine line, though, since the very act of engaging our low-level

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perceptual abilities is also what makes the audience perceive a presentation as "slick" or "cool."

BOB KANEFSKY

Kanef@netcom.com

Stan,

Style and substance . . . indeed! Where is your substance? True, you do quote your source (Marion Winik) but did you really fall for that old "Studies show" line, without specifying *which* studies, and how well done, and performed to grind whose ax?

Perhaps not relevant, as it gave you material for your monthly. But even if *some* listeners go 93 percent for style, and 7 percent for substance, is that necessarily fatal to democracy? You might go farther, and ask whether the *substance* of a message actually represents the speaker's beliefs, intents, or capabilities. No to all three, in many cases.

If the choice facing the voter is between two graduates of the "soundbite school," with equally glossy presentations—doesn't that cancel out and leave *only* the substance of the message? If any . . .

Let's face it—democracy is *not* a perfect form of government. Just a bit better than most of the alternatives. The people, or the voters, are not uniformly wise and good. (Were they so, we might not *need* government!) The rich and powerful will always find ways to exert disproportionate influence, no matter how convoluted their techniques must become. Our only hope is that there remains, among the rich and powerful, a diversity of interests and goals. Then their efforts may partially cancel one another, and a tiny bit of progress may occur.

WARREN RAYLE

aa565@Cleveland.Freenet.edu

No, I did not "fall for" the claim that "studies show"; I was quite careful to identify it only as a claim to consider that may *be at least approximately true, and its consequences* if *it is.*

The idea that glossy presentations cancel out and leave only substance to guide evaluation is a lovely hypothesis, but probably wishful thinking. I suspect the more important determinant is which style of gloss is more to a particular listener's taste!

Dear Stan,

In your March 1997 editorial, you quote someone as writing, "Studies show that 93 percent of what a listener gets out of any communication has to do with the demeanor, appearance, and likability of the messenger . . . ; only 7 percent is the message itself."

Your reaction to this statement bothers me a little. You seem to be saying that this is 93 percent style and 7 percent substance (or did I misinterpret this?). I believe that a large part of this statement is true and should be. We get a lot from messages besides the content: What is the sex, approximate age, approximate socioeconomic status, education, etc. of the speaker. This is probably most of what we get out of a message, and stuff like this is hard to change. So, I think calling this "style" is a little off base.

We also get some indication of how much the speaker knows about and

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believes in what they say. Sometimes we can get some vague belief about their emotional state. All this almost certainly can be changed by "style consultants."

Then, of course, we get the message.

If the writer included all of this in the 100 percent they were using, then I'm not surprised at all that 93 percent is non-message information.

Another thing that might be relevant is that people come in different types. I've been learning about Myers-Briggs Personality Type theory lately, and I think it can explain a lot. Different types of people have different *preferred* ways of dealing with various situations. (Note carefully, I said preferred. I didn't say that their type *determines* their reactions.) Some types of people prefer to pay more attention to messages than messengers. Some prefer to pay more attention to the messenger. Lumping all these types into a single statistic is concealing a lot.

However, when you get to your antepenultimate paragraph, I agree with you completely. We need consumers, and especially citizens, who can "see through the tricks, to cut past facades, and think critically about what people are actually saying."

On to other stories. "Gideon" read like the start of a novel. If so, please let Michael F. Flynn know that I enjoyed it and would really like to see the rest. I enjoy reading about smart people like Flaco.

Paul Levinson's on-line academy sounds interesting. Could you publish a URL for it? I've taken courses over ITV (Instructional Television). Some work better than classrooms (grad computer science). Others fail miserably (Introductory Japanese). In the CS courses, I was very happy to come back from travel and find all the tapes waiting for me. (Of course, the ITV fee was higher than the tuition.)

PAT MCGEE
jpm@roadrunner.com

Dear Dr. Schmidt:

I enjoyed Dr. Paul Levinson's excellent science fact article in the March '97 issue. How would one obtain more information about his organization (Connected Education)? I am puzzled as to why, after waxing eloquent about on-line education, he did not include an e-mail address in his article.

RICHARD D. GLOVER
rdglover@worldnet.att.net

Dear Dr. Schmidt:

I am writing in regards to Dr. Paul Levinson's fact article "Learning Unbound." First, I'd like to say that I firmly believe that a computer, especially one with a modem, can be one of the most powerful educational tools since the invention of the written word.

The reason I am writing, however, is because I feel that Dr. Levinson missed a large part of the potential market by focusing both his article and his business on graduate school courses. With concerns ranging from safety to literacy to specific curricula, many parents today are flocking towards homeschooling. In fact, I myself have been waiting to have children until I can afford to stay home with and

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eventually homeschool them.

It seems to me that the potential market for computer education is with these thousands of homeschooling parents more than graduate courses (although graduate school is obviously also a great use of on-line courses.) Parents who wish to homeschool but are concerned about their own ability to teach would certainly find on-line curricula a perfect solution. Their children could learn from the safety and comfort of their own home with their parents observing what is being taught but with a professional teaching the class.

Thank you for your time and attention.

AMY S. FARMER

Charleston, SC

The author replies . . .

Pleased to see the correspondence from Mr. Glover and Ms. Farmer.

Connected Education's e-mail address is TVozick@cinti.com—and http://www.cinti.com/connect-ed/ welcome is home for our Web pages. Web searches on "Connect Ed" and "Connected Education" will usually bring browsers to these pages, which have a complete catalog of our on-line courses, with requirements, tuition, etc., listed.

Ms. Farmer raises a very important question about on-line education on the primary and secondary school levels. Our organization has indeed focused mostly on the graduate level, with some undergraduate and non-credit professional courses offered. The common thread in this focus is that we deal with adults, for whom education is a source of knowledge.

Education for children of course should be a source of knowledge too. But it plays an additional crucial role in our society—one of socialization. Homeschooling, I think, can be a very viable alternative to traditional education—but to work on all levels, to be of maximum benefit to the children, it must take into account the socialization function of education as well.

Connect Ed has chosen to develop on-line education as a means of stimulating knowledge. I think that on-line education could indeed work very well as a means of homeschooling—but its developers would need to take into account the socialization issues which our organization is not geared to do. I would applaud such a development, undertaken by people with the competence to accomplish it, and would stand ready to lend whatever advice my organization could.

PAUL LEVINSON, PH.D. ■

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UPCOMING EVENTS Anthony Lewis

3–5 October 1997
ARCHON 21 (St. Louis area SF conference) at Gateway Center, Collinsville, Ill. Guest of Honor—Lois McMaster Bujold; Artist Guest of Honor—Mary Hanson-Roberts; Fan Guests of Honor—Barbara Stewart & Tim Hays; Special Guest of Honor—George R.R. Martin. Registration—$20 until 31 august 1997, $25 until 26 September and at the door. Kids 6-12, $5. Info: Archon 24, Post Office Box 483, Chesterfield, MO 63006-0483. (314) 326-3026. Email: zellich@i1.net

10–12 October 1997
NECRONOMICON '97 (Tampa area SF conference) at Camberly Inn, Tampa, Fla. Guests of Honor—Kevin & Rebecca Anderson and Joseph Green. Info: Post Office Box 2076, Riverview, FL 33568, (813) 677-6347. Email: 74273.1607@CompuServe.com Web Page: http://milieux.com/stonehill/sh.html OR http://www.stonehill.org

30 October–2 November 1997
1997 WORLD FANTASY CONVENTION at International Hotel, London, England. Guests of Honour—Iain Sinclair & Joan Aiken; Artist Guest of Honour—Bob Eggleton; Special Guests—Hugh B. Cave & R. Chetwynd-Hayes; Special Media Guest—Doug Bradley; MC—Robert Holdstock. Registration—$160 (100) attending, $50 (30) supporting. Registration limited to 750. Info: World Fantasy Convention, Post Office Box 31, Whitby, North Yorkshire, YO22 4YL, England. Web Page: http://www.farrsite.com/wfc/wfc4.htm

5–9 August 1998
BUCCONEER (56th World Science Fiction Convention) at Baltimore Convention Center and nearby hotels, Baltimore, Md. Guests of Honor—C. J. Cherryh, Milton A. Rothman, Stanley Schmidt, and Michael Whelan; TM—Charles Sheffield. Registration until 30 September 1997-$110 (80); supporting $30 (22); children +4 to +12 $55 (40), children -0.75 to +4.0 FREE (all ages as of 5 August 1998). This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Info: Bucconeer, Post Office Box 314, Annapolis Junction, MD 20701. Email: baltimore98@access.digex.net Web page: http://www.access.digex.net/~balt98

Convention runners: If your convention has a telephone, FAX, email, or Web page URL, please let us know so that we can publish this information.

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TECHNOLOGY UPDATE

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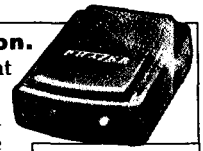

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